San Benito County Water District GSA

Valley Water

North San Benito

Groundwater Sustainability Plan

November 2021

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North San Benito Subbasin Groundwater Sustainability Plan

November 2021

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Appendix I – List of Public Meetings and Comments on the Plan

List of Acronyms

AF	acre-foot
AFY	acre-foot per year
AgMAR	agricultural managed aquifer recharge
APN	Assessor's Parcel Number
ASR	aquifer storage recovery
ATSDR	Agency for Toxic Substances and Disease Registry
AWMP	Agricultural Water Management Plan
Basin	North San Benito Subbasin
Basin Plan	Water Quality Control Plan for the Central Coastal Basin
BMPs	best management practices
Cal Poly	California Polytechnic State University
CASGEM	California Statewide Groundwater Elevation Monitoring
CCGC	Central Coast Groundwater Coalition
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Equality Act
CFS	cubic feet per second
CGS	California Geological Survey, formerly Division of Mines and Geology
CIMIS	California Irrigation Management Information System
ClO^{4-}	perchlorate
COC	constituent of concern
CPUC	California Public Utilities Commission
CRP	City and Regional Planning
Cr	chromium
Cr(VI)	hexavalent chromium
CSA	Community Service Area
CVP	Central Valley Project
CWC	California Water Commission
DDW	Division of Drinking Water
DHS	Department of Health Services
District	San Benito County Water District
DMS	data management system
DWR	California Department of Water Resources
DWSAP	Drinking Water Source Water Assessment Program
EC	electrical conductivity
EIR	Environmental Impact Report
ET	evapotranspiration
ETo	reference evapotranspiration
FB	Financing and Budgeting
Fe	iron
ft	feet
ft-bgs	feet below ground surface
GAMA	Groundwater Ambient Monitoring and Assessment
GBPO	General Basin Plan Objective
GDE	groundwater dependent ecosystem
GICIMA	Groundwater Information Center Interactive Map

GIS	Geographic Information Systems
GPS	Global Positioning System
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWMP	Groundwater Management Plan
HBSL	Health-Based Screening Level
HUA	Hollister Urban Area
HUAWP	Hollister Urban Area Water Project
IFI	Important Farmlands Inventory
IGC	Inter-Governmental Coordination
ILRP	Irrigated Lands Regulatory Program
in	inch
InSAR	Interferometric Synthetic Aperture Radar
IRWMP	Integrated Regional Water Management Plan
JP	Joint Partnerships with the Private Sector
JPL	Jet Propulsion Laboratory
JSA	Jones and Stokes Associates
LSCE	Luhdorff & Scalmanini Consulting Engineers
LTWMP	Long-term Wastewater Management Plans
MA	Management Area
MAR	managed aquifer recharge
MBAS	methylene blue active substances
MCL	Maximum Contaminant Level
MGD	million gallons per day
ug/L	micrograms per liter
mg/L	milligrams per liter
M&I	Municipal and Industrial
MMT	methylcyclopentadienyl manganese tricarbonyl
MO	Measurable Objective
MOU	Memorandum of Understanding
MPSP	Infrastructure and Service Master Plans, Strategies, and Programs
MRP	Monitoring and Reporting Program
msl	mean sea level
MT	Minimum Threshold
MW	monitoring well
N	nitrogen
NASA	National Aeronautics and Space Administration
NAVSTAR	Navigation Satellite Timing and Ranging System
NCCAG	Natural Communities Commonly Associated with Groundwater
NDMI	normalized difference moisture index
NDVI	normalized difference vegetation index
NED	National Elevation Dataset
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NO_3	nitrate
NPS	nonpoint source
NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service
NTUs	Nephelometric Turbidity Unit

OWTS	On-Site Wastewater Treatment System
PEIR	Program Environmental Impact Report
PI	public information
Ppb	parts per billion
PPWD	Pacheco Pass Water District
PREP	Pacheco Reservoir Expansion Project
PRISM	Parameter-Elevation Regressions on Independent Slopes Model
PSR	Planning Studies and Reports
Puc	Pliocene Unnamed Continental Mudstone (Purisima Formation)
Pus	Pliocene Unnamed Continental Sandstone (Purisima Formation)
PVWMA	Pajaro Valley Water Management Agency
Q	young alluvium
Qb	basin deposits
Qg	stream gravel
Qo	older alluvium
QT	continental
RDR	Regulation and Development Review
RMA	Resource Management Agency
RWQCB	Central Coast Regional Water Quality Control Board
SBCWD	San Benito County Water District
SBCWD GSA	San Benito County Water District GSA
SCVWD	Valley Water, formerly Santa Clara Valley Water District
SGMA	Sustainable Groundwater Management Act
SGMP	Sustainable Groundwater Management Planning
SMCL	Secondary Maximum Contaminant Level
SNMP	Salt and Nutrient Management Plan
SO	County Services and Operations
SSCWD	Sunnyslope County Water District
SSURGO	Soil Survey Geographic Database
SVRA	State Vehicular Recreation Area
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TCE	trichloroethylene
TDS	Total Dissolved Solids
TM	Technical Memorandum
TMDL	Total Maximum Daily Load
TPWD	Tres Pinos Water District
UNAVCO	University Navigation Satellite Timing and Ranging System Consortium
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WD	Water District
WDL	Water Data Library
WDR	Waste Discharge Requirement
WHO	World Health Organization

WRA	Water Resources Association
WSCP	Water Shortage Contingency Plan
WSP	Water Supply Plan
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WY	water year

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EXECUTIVE SUMMARY

The North San Benito Groundwater Basin (Basin) is the plan area for this Groundwater Sustainability Plan (GSP), developed consistent with the Sustainable Groundwater Management Act (SGMA). This basin was formed in 2019 by consolidating the Bolsa, Hollister, and San Juan Bautista Subbasins of the Gilroy-Hollister Basin and the Tres Pinos Valley Basin. Including about 200 square miles, the Basin is predominantly in San Benito County with small areas in Santa Clara County (**Figure ES-1**). The Basin shares a boundary along the Pajaro River with the Llagas Subbasin in Santa Clara County.

This GSP applies best available information to describe the plan area, groundwater resources, and associated surface water resources. Analysis of the groundwater basin condition, made with reference to sustainability indicators defined in SGMA, indicates that the North San Benito Basin has been managed sustainably, given availability of imported Central Valley Project (CVP) water.

Projections have been made into the future (simulated with the numerical groundwater flow model) of existing conditions, climate change, and reasonably anticipated growth. These projections indicate that the Basin can continue to be sustainable, assuming reasonable availability of CVP water, with implementation of projects and management actions to avoid undesirable results. These projects and management actions do not include any long-term planned reductions in groundwater pumping.

ES-1 GSP Development and Sustainability Goal

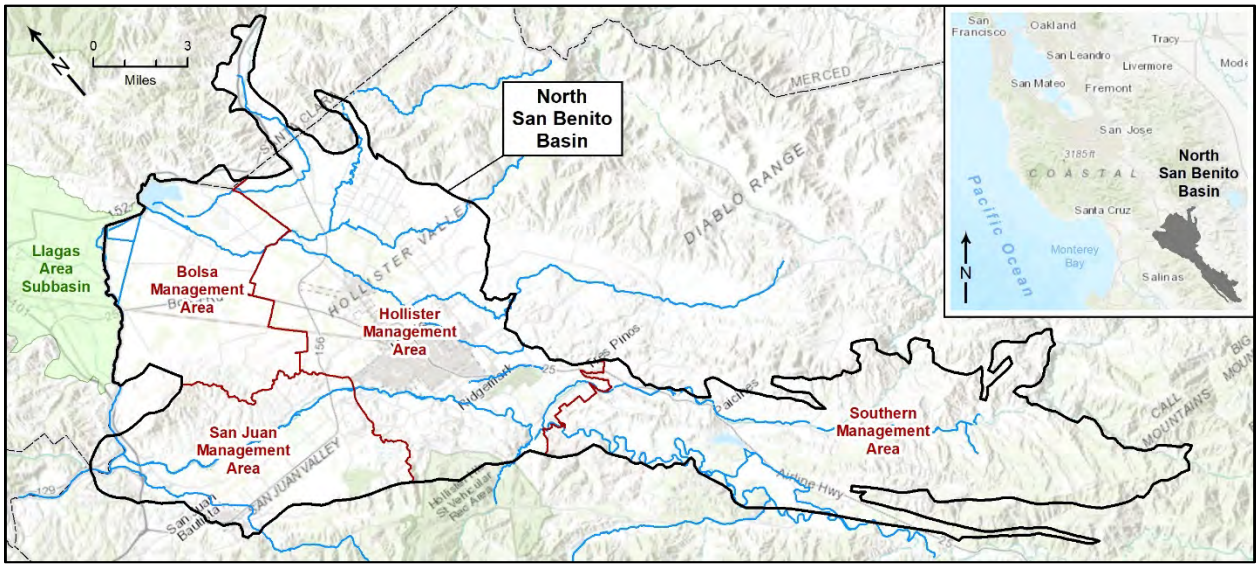
To manage this basin sustainably, the San Benito County Water District (SBCWD) and the Santa Clara Valley Water District, now Valley Water, have become Groundwater Sustainability Agencies (GSAs) and have agreed to collaborate in preparing this GSP with SBCWD GSA taking the lead and with cooperative implementation of the GSP into the future.

This GSP has been prepared with the participation of the public, local water and planning agencies, state agencies, and non-governmental organizations. SBCWD organized a Technical Advisory Committee (TAC) to support GSP development with multiple meetings open to the public. In addition, six public workshops have been conducted, and regular updates provided at public meetings of the SBCWD Board of Directors. Fact sheets, fliers, and mailers on key topics have been distributed. Workshop and meeting notices have been posted to the SBCWD website, which also provides information on SGMA and the GSP. Outreach materials including factsheets have also been translated into Spanish.

The goal of the GSAs in preparing this GSP is to sustain groundwater resources for the current and future beneficial uses of the North San Benito Basin in a manner that is adaptive and responsive to the following objectives:

- to provide a long-term, reliable, and efficient groundwater supply for agricultural, domestic, and municipal and industrial uses
- to provide reliable storage for water supply resilience during droughts and shortages
- to protect groundwater quality
- to prevent subsidence
- to support beneficial uses of interconnected surface waters, and
- to support integrated and cooperative water resource management.

Figure ES-1. North San Benito Basin and GSP Management Areas.



This sustainability goal, consistent with SGMA, was developed by GSA staff and consultants and the TAC through public discussion and based on the technical information in this GSP.

Preparation of this GSP began in 2018 with award by the California Department of Water Resources (DWR) to SBCWD of a Sustainable Groundwater Management Planning Grant amounting to $830,366. Subsequently, SBCWD applied for additional grant funding—part of the so-called Round 3—and was awarded an additional $1.17 million. With SBCWD GSA cost sharing of $390,000, the total Round 3 project cost is $1.56 million. The Round 3 project, initiated in June 2020, involves a program to site, design, and install dedicated monitoring wells and a feasibility study for Managed Aquifer Recharge (MAR) to supplement groundwater recharge. The Round 3 project is incorporated into this GSP.

Implementation of the GSP will include compliance with SGMA with GSP administration, monitoring of the basin (including annual assessment of groundwater extraction), expanded reporting, and five-year updates. This expanded management will involve increased annual costs. Accordingly, SBCWD has investigated means of funding within its authority from the original San Benito County Water District Act and from SGMA. As described in this GSP, funding methods include an acreage-based fee for parcels in the basin benefitting from groundwater management and a groundwater-extraction based fee that supports annual measurement of groundwater pumping.

ES-2 Plan Area

The Plan Area includes valley areas characterized by productive agriculture, urban areas including the City of Hollister and the City of San Juan Bautista, rural communities, and upland areas with grazing land. While SBCWD and Valley Water provide regional water management, much of the population in the GSP area is served by local water agencies. The largest of these are the City of Hollister and Sunnyslope County Water District (SSCWD), which serve the Hollister urban area.

Groundwater is the main source of water supply. Groundwater provides supply to municipal, agricultural, and domestic users through more than 1,000 production wells located throughout the GSP Area. The other major source is imported water from CVP, which is delivered to municipal water suppliers and to agricultural customers in the SBCWD zone of benefit, Zone 6.

Local surface water also is a supply, made available through groundwater recharge. SBCWD owns and operates two reservoirs along the San Benito River, Hernandez Reservoir and Paicines Reservoir, where water is stored and then released for groundwater recharge. Local surface water also is supplied from other local streams, including Pacheco Creek, for groundwater recharge. Recycled water is a reliable, local supply for non-potable uses. Water recycling is a cooperative effort of SBCWD and the City of Hollister; recycled water is provided by the City of Hollister for irrigation.

Both SBCWD and Valley Water have a long history of water management, including coordination with the respective counties, cities, and other agencies with responsibility for land use planning. A summary is provided of previous and ongoing water resources monitoring and management programs. The GSP builds on previous monitoring and management programs to evaluate groundwater conditions in light of the sustainability goal and SGMA sustainability criteria, to identify monitoring and management needs, and to plan and implement projects and management actions for long-term sustainability. To support planning and implementation, this GSP process has identified four Management Areas—Southern, Hollister, San Juan, and Bolsa—shown in **Figure ES-1**.

ES-3 Hydrogeologic Conceptual Model

The *hydrogeologic conceptual model* of the North San Benito Basin is a description of the physical framework of the Basin, including its geology and the aquifers that provide significant groundwater. It also addresses the interaction between groundwater and surface water, and areas of groundwater recharge and discharge.

The Basin consists of a series of connected valleys and intervening uplands in the Coast Ranges. It is characterized by unconsolidated to semi-consolidated sediments that were deposited in alluvial fan and stream environments from a variety of source rocks and directions. These deposits interfinger in the subsurface so that regional zones of low or high permeability have not been distinguished. The valley portions contain unconsolidated alluvial deposits—clay, silt, sand, and gravel—that store and transmit significant quantities of groundwater. These geologic deposits also underlie some upland areas (such as the Lomerias Muertas, Flint Hills, and hills in the southern portion of the Basin) but generally are more consolidated and less permeable than in the valley areas. The Principal aquifers include the unconsolidated alluvial deposits in the valley areas and generally range from 0 to 300 feet thick. Secondary aquifers include the older, less permeable deposits that underlie the valleys at depth, crop out in portions of the valley areas, and occur in upland areas with thickness up to several thousand feet.

The Basin boundaries are defined mostly by geology (contacts with relatively impermeable consolidated rocks) and by faults that may form barriers to groundwater flow. Faults crossing the Basin, most notably the Calaveras Fault, are partial barriers to groundwater and also are important because they may offset bedrock and affect the local depth of the Basin.

Unlike most North San Benito boundaries, the northern boundary with the Santa Clara County Llagas Subbasin is defined by the county line. Like the northernmost North San Benito Basin, the Llagas

Subbasin underlies a relatively flat valley and consists of unconsolidated alluvial sediments. The North San Benito and Llagas basins are hydrologically connected with groundwater flow across the boundary.

The Basin is situated within the Pajaro River watershed. Main tributaries to the Pajaro River include the San Benito River, Tres Pinos Creek, and Pacheco Creek, among others. These streams are dry over most of their lengths for much of the year, flowing mainly during wet winter conditions.

Groundwater recharge occurs over the entire surface of the Basin, in varying intensities. Dispersed recharge over broad areas derives from deep percolation of rainfall and applied irrigation water. Subsurface inflow to the Basin occurs from surrounding consolidated formations and from Llagas Subbasin. Percolation from streams is a major source of recharge. Percolation from ponds also occurs, including percolation from wastewater treatment plant disposal ponds. Recharge also occurs through SBCWD's MAR programs with a long history of percolating available surface water to augment recharge.

With regard to groundwater discharge, wells are by far the largest discharges from the Basin. Natural outflow from the Basin consists of groundwater discharge into streams. The primary exit points are groundwater seepage into the lower ends of the Pajaro and San Benito Rivers as they approach the northwestern end of the basin and enter the bedrock canyon leading to the coast.

ES-4 Current and Historical Groundwater Conditions

The North San Benito Basin has been actively monitored for decades. For this GSP's description of groundwater conditions, a historical period has been defined that begins in 1975 and extends through 2017. This period is representative of long term conditions and includes droughts and wet periods, with an average annual rainfall of 12.97 inches. Current conditions are described as 2015 through 2017. Groundwater conditions are described in terms of sustainability indicators including groundwater elevations, groundwater storage, land subsidence, groundwater quality, and interconnected surface water and groundwater dependent ecosystems.

Groundwater Elevations

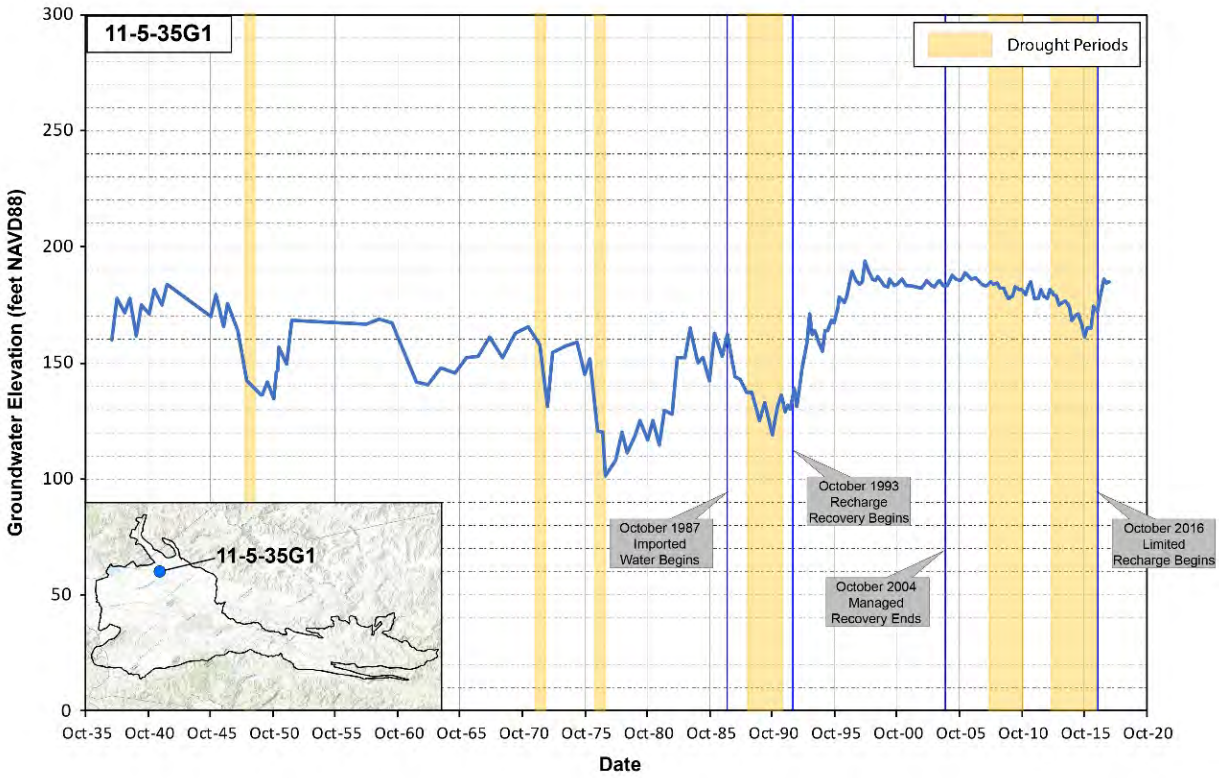
Groundwater is present in the principal and secondary aquifers that generally are not distinguished in the Basin. Groundwater in Basin aquifers occurs under unconfined to confined (pressurized) conditions, and areas with artesian flowing wells have been mapped. However, distinct vertical zones have not been mapped, so groundwater level maps and hydrographs generally represent a range of depth zones. In addition, most monitored wells in the Basin are production wells with considerable screen lengths. Nonetheless, these generally represent the productive zones of the Basin.

Groundwater elevations change in response to wet years and droughts, groundwater pumping, importation of water, and managed aquifer recharge programs. Long term changes in groundwater elevations are illustrated in this GSP by hydrographs from representative wells across the Basin. Most of these show conditions since 1975. A hydrograph dating back to 1935 is shown in **Figure ES-2.**

As a historical overview, groundwater elevations are estimated to have been at historical highs prior to 1913. With gradual development of irrigated agriculture and intensification of groundwater pumping, groundwater elevations in valley areas of the Basin generally decreased from the 1940s to the 1970s, indicating a state of overdraft. At the time, the Basin relied solely on groundwater (although recharged from local reservoirs) and groundwater elevations in many wells reached historical lows.

In 1987, SBCWD began importation of CVP water and groundwater elevations began to rise in the Hollister and San Juan valleys and Bolsa, although Bolsa does not directly receive CVP water. The severe 1987-1992 drought slowed the recovery of groundwater elevations because of reduced CVP imports and reduced recharge from rainfall and surface water. Following that drought, CVP imports increased, allowing reduction of groundwater pumping and recovery of groundwater elevations. In addition, from 1994 to 2004, SBCWD actively recharged the Basin with CVP water along stream channels. The result of CVP imports and SBCWD MAR programs was significant recovery especially in the Hollister and San Juan valleys where imported water is delivered. With groundwater elevation recovery, SBCWD has shifted its MAR program from recovery to maintenance and local sustainable management of groundwater.

Figure ES-2. Long-term Hydrograph of Groundwater Elevations, Hollister Management Area



This GSP presents groundwater elevation contour maps to show current (2017) groundwater flow conditions. Groundwater flow generally parallels the major surface streams from the southeast and eastern portions of the Basin toward the northwestern portions and the Pajaro River. In the Bolsa, groundwater flow converges into areas of low groundwater elevations that are caused by groundwater pumping. Such groundwater depressions occurred historically, not only in the Bolsa, but also in the Hollister and San Juan valleys. As shown on the map, the groundwater depressions in Hollister and San Juan valleys have filled and general northward groundwater flow has resumed.

The current monitoring network for groundwater elevations provides little information about vertical groundwater gradients within the Basin. Flowing artesian wells have been reported historically and in recent years clearly indicate that upward gradients and flow exist locally.

Groundwater Storage

The groundwater basin provides not only supply, but also storage. SBCWD has managed groundwater and surface water sources conjunctively, such that groundwater in storage is used when surface water supplies are diminished, and groundwater storage is replenished when surface water supplies are available. Accordingly, groundwater storage is characterized by changes in the short term. However, the key issue is to avoid long term depletion of storage, commonly understood as overdraft. The Annual Groundwater Reports prepared by SBCWD have included an annual accounting for groundwater storage, and in North San Benito, groundwater storage has been stable for the long term, given availability of CVP supply since 1987.

Land Subsidence

Land subsidence is the uneven lowering or settlement of the ground surface due to pumping and groundwater level declines. Subsidence can have impacts including collapsed well casings, damage to infrastructure (including foundations, roads, bridges, or pipelines), diminished effectiveness of levees, and loss of conveyance in canals, streams, or channels.

In brief, as groundwater pumping occurs and groundwater elevations decline, fine-grained deposits such as clay and silt can become compacted, causing the overlying ground surface to subside. While land subsidence due to groundwater withdrawals can be temporary (elastic), it can also become permanent (inelastic) when groundwater elevations in the aquifer reach a historically low groundwater elevation.

Inelastic subsidence has not been a known issue in the Basin. Nonetheless, its potential was recognized in the 2003 Groundwater Management Plan, which recommended maintenance of groundwater levels above the historical low levels of about 1977 to avoid or minimize the potential for inelastic land subsidence. SBCWD management of groundwater elevations generally has been successful in meeting these objectives, and there have been no local reports of subsidence problems. However, mapping of land surface elevation changes by DWR since 2015 (using satellite imagery) indicated local land surface subsidence. To check this mapping, land surface elevation data from UNAVCO (a university-organized program that measures the shape of the earth) were reviewed for this GSP. The UNAVCO data also indicated local subsidence in the Bolsa. Measured locally at a rate of about two inches over the past 15 years, the available data suggest inelastic subsidence. Continued tracking of InSAR and UNAVCO is planned by this GSP.

Groundwater Quality

Groundwater quality in the Basin has been described as highly mineralized and of marginal water quality for drinking and agricultural purposes. The mineralized water quality is typical of other relatively small Coast Range groundwater basins and reflects the geology of the watershed and relatively low permeability of groundwater basin sediments.

Groundwater in the Basin has also been impacted by human activities including agricultural, urban, and industrial land uses. State agencies with regulatory oversight for water quality in the Basin include the Central Coast Regional Water Quality Control Board (RWQCB) and the State Water Resources Control Board – Division of Drinking Water (DDW). This GSP summarizes potential threats to water quality including regulated sites with soil and groundwater contamination, septic tanks, an oil and gas field, and non-point sources, for example nitrate from agricultural and landscaping applications.

This GSP summarizes regional water quality monitoring networks. SBCWD currently monitors a distributed network of 18 wells for water quality and maintains a comprehensive water quality database, created in 2004 and updated every three years with reporting through the SBCWD Annual Groundwater Reports. Available data have been compiled from SBCWD, local water agencies, RWQCB, and DDW. The RWQCB regulates discharges from irrigated agricultural lands to protect surface water and groundwater, focusing on priority water quality issues, such as pesticides and toxicity, nutrients, sediments, and especially nitrate impacts to drinking water sources. DDW regulates drinking water systems in the Basin. The GSAs share information and collaborate with both.

Total dissolved solids (TDS) is a key constituent of concern for the Basin. TDS concentrations are naturally high because of local geology. However, TDS also is affected by human activities (e.g., infiltration of urban runoff, agricultural return flows, and wastewater disposal).

Nitrate also is a key constituent of concern. Elevated nitrate levels in groundwater are found in valley areas throughout the Basin, reflecting agricultural activities, septic systems, confined animal facilities, landscape fertilization, and wastewater treatment facility discharges.

Other constituents are described in this GSP including hardness, boron, perchlorate, and metals including arsenic, chromium, iron, manganese, and selenium.

Interconnected Surface Water and Groundwater Dependent Ecosystems

Interconnection of groundwater and surface water occurs wherever the water table intersects the land surface and groundwater discharges into a stream channel or spring. In this GSP, locations of interconnected surface water and groundwater have been evaluated using information on stream flow, depth to groundwater, and vegetation. In addition, groundwater dependent ecosystems (GDEs) also have been identified with consideration of wetlands, riparian vegetation, and animals including amphibians and steelhead trout. This GSP also includes analysis of potential undesirable effects of groundwater pumping on riparian vegetation and on steelhead. This has included: review of aerial photographs and imagery to assess other factors such as in-channel gravel mining, scour by flood events, and drought; evaluation of any correlation of groundwater levels with vegetation extent and vigor; and numerical modeling to assess effects of basin pumping on steelhead migration.

ES-5 Water Balances

This GSP provides a quantitative assessment of the water balance (or water budget) of the North San Benito Basin. Both surface water and groundwater balances are provided for each of the four Management Areas. Annual balances based on historical data are presented for three periods: a Pre-CVP Historical (1975-1988), a Historical Recovery (1989-2014), and a Current (2015-2017). Cumulative changes in groundwater storage generally have increased for the historical and current periods as illustrated in **Figure ES-3**. In addition, a future water balance (2018-2068) has been simulated with numerical modeling. The Future period represents conditions expected to occur over the next 50 years and the “future baseline” simulation assumes a continuation of existing land use, urban water demand, water, and wastewater treatment and CVP availability.

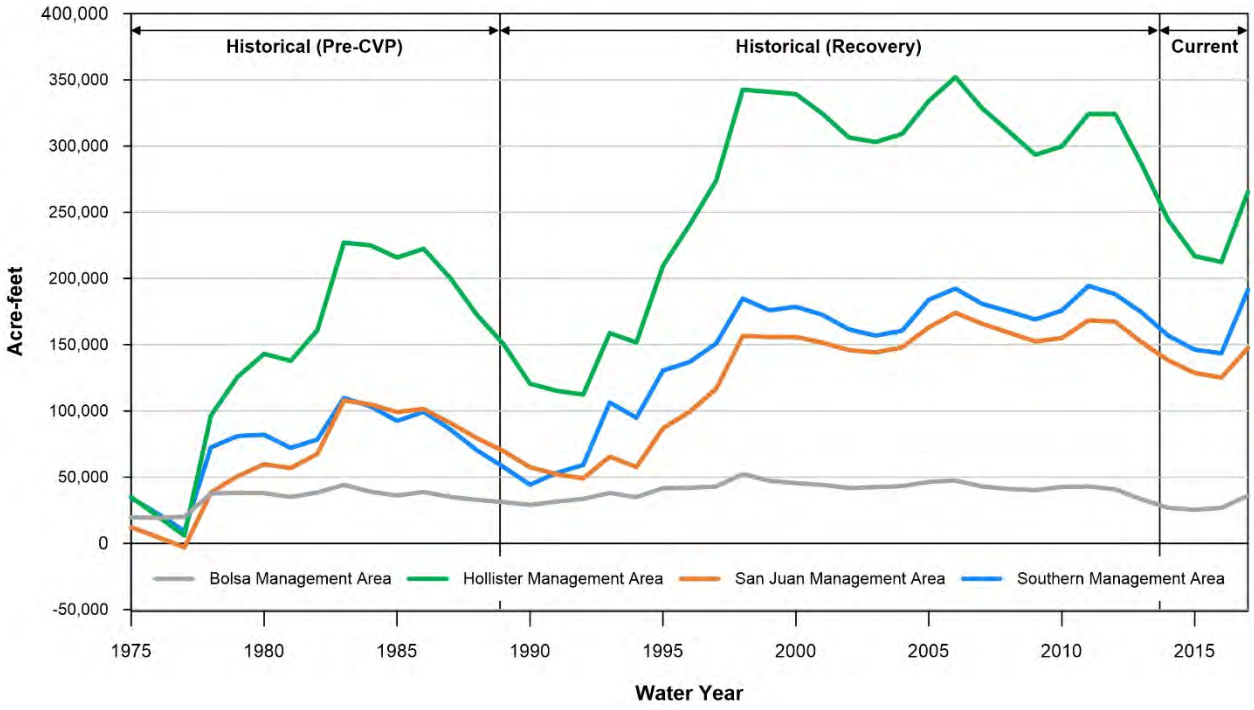
The groundwater balances (including inflows, outflows, and change in storage) are summarized for each of the four periods and for the four management areas. In brief, the balances generally are positive—

indicating net increases in storage—although very small declines in storage (probably in the range of uncertainty) are indicated in the Future scenario for Hollister, San Juan, and Bolsa Management Areas.

In addition, the GSP presents additional numerical modeling forecasting scenarios, building on the future baseline scenario with climate change and with growth. The climate change scenario (based on the future baseline scenario) involved adjustments to climate, stream flow, and imports as projected by DWR. The general result is that the climate in 2070 will be warmer and wetter, and CVP imports are expected to be reduced. Climate changes results in increased pumping in the scenario but expected groundwater level declines are offset by increased stream flow and rainfall recharge. In brief, no significant long-term water-level or storage trends are shown by the climate change scenario relative to the baseline scenario.

The future growth scenario assumes buildout in the Hollister urban area and an increase in vineyard acreage. This scenario assumes 2068 buildout and land use throughout the simulation and does not phase in land use changes over time. This approach reveals the full effect of 2068 assumed land use; as simulated, the effects of projected growth on groundwater storage change over time are small.

Figure ES-3. Cumulative Storage Change over Historical and Current Periods for Management Areas



ES-6 Sustainable Management Criteria

This GSP defines sustainable management as the use and management of groundwater in a manner that can be maintained without causing *undesirable results*, which are defined as significant and unreasonable effects caused by groundwater conditions occurring throughout the Basin, specifically in consideration of the following SGMA sustainability indicators:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply.
- Significant and unreasonable reduction of groundwater storage.
- Significant and unreasonable seawater intrusion. [1]
- Significant and unreasonable land subsidence that substantially interferes with surface land uses.
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

For these sustainability indicators, a GSP must develop quantitative sustainability criteria that allow the GSA to define, measure, and track sustainable management. These criteria include the following:

- Undesirable Result – significant and unreasonable conditions for any of the six sustainability indicators.
- Minimum Threshold (MT) – numeric value used to define undesirable results for each sustainability indicator.
- Measurable Objective (MO) – specific, quantifiable goal to track the performance of sustainable management.

While the North San Benito Basin has been managed sustainably, the following sustainability criteria are defined in this GSP because potential exists for undesirable results. Sustainability criteria are as follows:

- The Minimum Threshold relative to **chronic lowering of groundwater levels** is defined at designated Key Wells by historical groundwater low levels adjusted to provide reasonable protection to nearby wells. Undesirable results are indicated when two consecutive exceedances occur in each of two consecutive years, in 60 percent or more of the Key Wells (e.g., three of five wells) in each Management Area. The Measurable Objective is to maintain groundwater levels above the MTs and to maintain groundwater levels within the historical operating range.
- The Minimum Threshold for **reduction of storage** for all Management Areas is fulfilled by the minimum threshold for groundwater levels as proxy. The Measurable Objective for storage is fulfilled by the MT for groundwater levels, which maintains groundwater levels within the historical operating range.
- The Minimum Threshold for **land subsidence** is defined as a rate of decline equal to or greater than 0.2 feet in any five-year period. This has been considered in terms of a potential cumulative decline equal to or greater than one foot of decline since 2015; 2015 represents current conditions and the SGMA start date. The extent of cumulative subsidence across the basin will be monitored and evaluated using InSAR data. Subsidence is closely linked to groundwater levels, and it is unlikely that significant inelastic subsidence would occur if groundwater levels remain above their minimum thresholds.
- The Minimum Thresholds for **degradation of water quality** address nitrate and TDS for each MA. The MT for nitrate is defined initially as the percentage of wells with concentrations exceeding the nitrate maximum contaminant limit (45 mg/L) based on current conditions (2015-

[1] Seawater intrusion is noted, but no risk of seawater intrusion exists in this inland basin.

2017). The MT for TDS is defined initially as the percentage of wells with concentrations exceeding the TDS value of 1,200 mg/L based on current conditions. The Measurable Objectives for both are defined as maintaining or reducing the percentage of wells with median concentrations exceeding the MTs.

- The Minimum Threshold for **depletion of interconnected surface water** is the amount of depletion associated with the lowest water levels during the 1987-1992 drought, with some adjustments made for wells with groundwater levels lower in 2016 than in 1992. Undesirable results would occur if more than 25 percent of monitored wells within 1 mile of a shallow water table reach along the Pajaro River, Pacheco Creek, San Benito River, or Tres Pinos Creek had static spring water levels lower than the lowest static spring water level during 1987-1992.

ES-7 Monitoring

The GSAs have maintained active monitoring for decades, but compliance with SGMA will require more intensive monitoring across the Basin. The GSP describes the monitoring network needed to provide the information that fulfills SGMA requirements, guides GSP implementation, and allows demonstration of sustainable conditions. The monitoring program includes a monitoring network that documents groundwater and related conditions as relevant to the sustainability indicators: groundwater levels, storage, land subsidence, water quality, and interconnected surface water.

This GSP also describes the monitoring protocols for data collection, development and maintenance of the data management system (DMS), and regular assessment and improvement of the monitoring program. Data gaps are identified and the steps to fill the data gaps are described. This GSP also summarizes the siting of new dedicated monitoring wells, installed with funding assistance from the Sustainable Groundwater Management Round 3 Grant program (Round 3).

ES-8 Projects and Management Actions

As assessed in this GSP, groundwater conditions in North San Benito are sustainable. However, long-term sustainability requires continuation of monitoring, reporting, and management actions that are adaptive to changing climatic, water supply, and water demand conditions. Accordingly, this GSP presents ongoing, new, and recommended projects and management actions needed to maintain sustainability. Projects and actions are described in terms of objectives, circumstances of implementation, public notice, permitting and regulatory process, timetable, benefits, costs, and how the action will be accomplished.

Projects are substantial efforts that involve an increase in water supply or a reduction in demand for the GSP Area. Four categories of projects are presented as listed below:

- Develop Surface Water Storage (Pacheco Reservoir Expansion Project)
- Expand Managed Aquifer Recharge (MAR)
- Enhance Conjunctive Use
- Enhance Water Conservation.

The projects involve conjunctive use of available supplies plus water conservation. These produce benefits by maintaining groundwater levels above minimum thresholds and thereby avoiding chronic groundwater level declines, storage depletion, subsidence, and reduction of potential impacts to GDEs.

The projects also promote water quality improvement by maximizing high quality imports and supporting basin outflows.

Management Actions provide a framework for groundwater management including establishing GSP procedures or policies, filling data gaps with scientific studies or improved monitoring, and providing for funding. Six categories are provided:

- Improve Monitoring Program and Data Management System (DMS)
- Develop Response Plans
- Enhance Water Quality Improvement Programs
- Reduce Potential Impacts to GDEs (Steelhead and Riparian Vegetation)
- Provide Long-term Basin-wide Funding Mechanism
- Provide Administration, Monitoring, and Reporting.

The first management action supports the cost-effective implementation of all projects and management actions. The next three management actions address response plans, water quality improvement, and protection of GDEs. These were identified during the GSP process to provide specific GSA responses to potential undesirable results. Water quality protection is addressed not only by maximizing high quality imports and improving wastewater quality, but also by supporting the SNMP, RWQCB, and other programs. The last two actions in the list provide the needed funding, administration, monitoring, and reporting on an annual basis.

ES-9 Implementation Plan

While the North San Benito Groundwater Basin is considered to be sustainably managed, this status is by no means taken for granted. Potential effects of growth, land use change, and climate change have been evaluated by means of modeling simulations, but effects are likely to be cumulative, and thereby present challenges to sustainability. Additional projects and actions must be continued or implemented to satisfy the Sustainability Goal to the foreseeable planning horizon. This GSP presents an implementation plan with a timeline that begins in 2022 and continues until 2042.

1. INTRODUCTION

Since its founding in 1953, San Benito County Water District (SBCWD or District) has actively managed water resources in San Benito County. This management, focused on conjunctive use of groundwater and surface water sources, was formalized in 1998 through adoption of its Groundwater Management Plan (GWMP), updated in 2004. In 2014, the State of California passed the Sustainable Groundwater Management Act (SGMA) to empower local agencies to adopt Groundwater Sustainability Plans (GSPs) tailored to the resources and needs of their communities. SGMA also empowers local agencies to form a Groundwater Sustainability Agency (GSA) for managing groundwater resources sustainably. Accordingly, the San Benito County Water District GSA (SBCWD GSA) was formed to continue groundwater management with the goal of sustainability in accordance with SGMA.

Figure 1-1 shows the full extent and boundaries of the North San Benito Basin No. 3-003.05, a subbasin of the Gilroy-Hollister Basin per California Department of Water Resources (DWR) Bulletin 118, which is also the Plan Area for this GSP. This basin was formed in 2019 by consolidating the Bolsa, Hollister, and San Juan Bautista Subbasins of the Gilroy-Hollister Basin and the Tres Pinos Valley Basin. The Plan Area is predominantly in San Benito County with 3,354 acres or about 2.6 percent extending into Santa Clara County.

In May 2017, SBCWD became the GSA for the Bolsa Subbasin and for the Hollister and San Juan Bautista Subbasins within San Benito County. In August 2018, SBCWD became GSA for the Tres Pinos Valley. **Appendix A** provides the SBCWD Notices of Decision to become a Groundwater Sustainability Agency. Valley Water (formerly known as Santa Clara Valley District (SCVWD) prior to 2019) is the GSA for the portions in Santa Clara County.

Wishing to provide a framework for cooperative groundwater management efforts, in July 2017, SBCWD and SCVWD (Valley Water) executed a Memorandum of Understanding (MOU), which sets forth their respective roles and responsibilities in GSP preparation for the North San Benito Basin. These include data sharing and coordinated outreach, among other responsibilities. Per the MOU, SBCWD is responsible for executing contracts with consultants to undertake development of the GSP. This MOU is reproduced in **Appendix B**.

The four historical groundwater basins (Bolsa, Hollister, San Juan Bautista, and Tres Pinos Valley) were defined by DWR in its Bulletin 118 (DWR, 2004a, b, c, d). These were managed and monitored by SBCWD (in cooperation with Valley Water) since at least 1976, although the definition of basin boundaries and the focus of various studies have differed over the years. Recognizing that the basins are contiguous, hydraulically connected, and comprehensively managed, SBCWD submitted a request to DWR to consolidate the four basins into a single basin, termed the North San Benito Groundwater Basin. The SBCWD Resolution 2018-05, making this request, is included in **Appendix A**. This request was approved in 2019 and followed by appropriate update of GSA Formation Notifications to DWR.

As described in Section 5 and shown in **Figure 1-1**, the North San Benito Basin has been divided into four Management Areas—Southern, Hollister, San Juan, and Bolsa—to support GSP planning and implementation.

1.1. Purpose of the Groundwater Sustainability Plan

The purpose of this GSP is to assess water resource and land use conditions within the Plan Area, through an open and collaborative process, and to implement management activities to achieve (or maintain) long-term groundwater sustainability as defined by SGMA.

1.2. Sustainability Goal

The sustainability goal can be described as the mission statement of the GSAs for managing the basin; it embodies the purpose of sustainably managing groundwater resources and reflects the local community's values—economic, social, and environmental. The sustainability goal for the North San Benito Groundwater Basin, stated below and described in more detail in Section 6.1, was developed by GSA staff and consultants and the Technical Advisory Committee (TAC) through public discussion.

1.2.1. Description of Sustainability Goal

The goal of the GSAs in preparing this GSP is to sustain groundwater resources for the current and future beneficial uses of the North San Benito Basin in a manner that is adaptive and responsive to the following objectives:

- to provide a long-term, reliable, and efficient groundwater supply for agricultural, domestic, and municipal and industrial uses
- to provide reliable storage for water supply resilience during droughts and shortages
- to protect groundwater quality
- to prevent subsidence
- to support beneficial uses of interconnected surface waters, and
- to support integrated and cooperative water resource management.

This goal is consistent with SGMA and is based on information from the Plan Area, Hydrogeologic Conceptual Model, Groundwater Conditions, and Water Budget sections of this GSP.

1.3. Agency Information

Two GSAs—SBCWD and Valley Water—are collaborating on preparation of this GSP, as described in the July 2017 MOU between the two districts. Valley Water is the exclusive GSA for groundwater basins within its jurisdiction, per §10723 of the Water Code. SBCWD GSA was formed through the following processes for the Bolsa, Hollister, and San Juan Bautista basins and for the Tres Pinos Valley:

Bolsa/Hollister/San Juan Bautista

- A properly noticed public hearing was held by SBCWD on February 8, 2017 to determine whether to become a GSA for the Bolsa, Hollister, and San Juan Bautista basins within San Benito County. The SBCWD Board of Directors adopted Resolution 2017-03 to form a GSA.
- On February 24, 2017, SBCWD submitted to DWR a Notice of Decision to Become a Groundwater Sustainability Agency, along with required information including a boundary map of the GSA and a list of interested parties.
- After the 90-day review period, on May 30, 2017, SBCWD GSA became exclusive groundwater sustainability agency.

Tres Pinos Valley

- On April 25, 2018, a properly noticed public hearing was held by SBCWD to determine whether to become a GSA for the Tres Pinos Valley. The SBCWD Board of Directors adopted Resolution 2018-06 to form a GSA for the Tres Pinos Valley.
- On May 4, 2018, SBCWD submitted to DWR a Notice of Decision to Become a Groundwater Sustainability Agency, along with the required information including a boundary map and list of interested parties.
- After the 90-day review period, on August 2, 2018, SBCWD GSA became exclusive groundwater sustainability agency for Tres Pinos Valley.

Subsequently in May 2018 SBCWD submitted a request to DWR to consolidate the four basins into a single basin, termed the North San Benito Groundwater Basin. This request was approved in 2019 and on July 2, 2019, SBCWD GSA submitted a GSP Initial Notification to DWR for development of a GSP for the North San Benito Groundwater Basin. On July 9, 2019, the SBCWD GSA became the exclusive GSA for the North San Benito Groundwater Basin in San Benito County. On July 30, 2019, Valley Water updated its status as exclusive GSA for the North San Benito Groundwater Basin in Santa Clara County.

As required by GSP Regulations §354.6 and SGMA §10723.8, the Notices of Decision to become a Groundwater Sustainability Agency are included in **Appendix A**. These each include the resolution, list of interested parties, and boundary map.

The point of contact for the SBCWD GSA is:

Jeff Cattaneo, General Manager
San Benito County Water District
30 Mansfield Rd
Hollister, Ca 95024
(831) 637-8218
jcattaneo@sbcwd.com

1.4. Groundwater Sustainability Agency Information

Preparation of this GSP is under the authority of SBCWD and Valley Water, which are GSAs for the Plan Area and are working together with SBCWD serving as lead agency.

San Benito County Water District is a special district formed in 1953 under State law (California Water Code Appendix 70) pursuant to the San Benito County Water District Act. It originally was formed as the San Benito County Water Conservation and Flood Control Act. The name was changed from the San Benito County Water Conservation and Flood Control District to San Benito County Water District in 1989.

SBCWD has broad powers for the acquisition, storage and distribution of water for irrigation, domestic, fire protection, municipal, commercial, industrial, and all other beneficial uses, as follows:

- to store water in surface or underground reservoirs
- to conserve and reclaim water
- to appropriate and acquire water and water rights, import water and conserve it
- to control flood and storm waters of streams that flow into district, and to conserve such waters for beneficial purposes by spreading, storing, retaining, and causing to percolate

- to carry on technical and other necessary investigations, make measurements, collect data, make analyses, studies, and inspections pertaining to water supply, water rights, control of flood and storm waters, and use of water.

SBCWD is the county-wide manager of water resources, the owner and operator of local surface water reservoirs (Hernandez and Paicines) and associated recharge operations, and the wholesaler for Central Valley Project (CVP) supplies from the U.S. Bureau of Reclamation (USBR). SBCWD has established three Zones of Benefit reflecting these responsibilities, as described in **Table 1-1**. While Zone 1 is the entire San Benito County, the extents of Zones 3 and 6 are shown in **Figure 1-2.** Zone 6 is the area where CVP water is provided; remaining areas rely on groundwater wells.

Table 1-1. SBCWD Zones of Benefit

Zone	Area	Provides
1	Entire County	Specific District administrative expenses
3	San Benito River Valley (Paicines to San Juan) and Tres Pinos Creek Valley (Paicines to San Benito River)	Operation of Hernandez and Paicines reservoirs and related groundwater recharge and management activities
6	San Juan, Hollister East, Hollister West, Pacheco, Bolsa SE, and Tres Pinos subbasins	Importation and distribution of CVP water and related groundwater management activities

SBCWD is governed by a five-person Board of Directors that elects a president from its members and appoints a secretary. The SBCWD Board of Directors serves as the Board of Directors for the SBCWD GSA. The Board meets monthly at its office, located at 30 Mansfield Road, Hollister. Meetings are announced, and agenda are posted on the SBCWD website; the meetings are open to the public. The board (except as otherwise specifically provided in the California Water Code) manages and conducts the business and affairs of SBCWD and the GSA. A majority vote of directors present at any meeting attended by a quorum is necessary to determine any proposition or resolution presented. The Board is supported by operations staff and by Administrative Staff, including the General Manager who is the GSA Point of Contact (see above) and Project Manager for the GSP.

Valley Water (SCVWD) is the GSA for the portion of the GSP area in Santa Clara County. Valley Water is a special district with jurisdiction throughout Santa Clara County. It formed in 1951 as the Santa Clara County Flood Control and Water District; its name subsequently was changed to Santa Clara Valley Water District. As of 2019, SCVWD is known as Valley Water and this name is used in this GSP, except when the historical name is needed for clarity. Valley Water provides wholesale water supply, stream and watershed stewardship, and flood protection for Santa Clara County. In addition, Valley Water manages the County's groundwater basins. Valley Water is a CVP and State Water Project (SWP) contractor and receives water from the San Felipe Division facilities through the Pacheco and Santa Clara Conduits, with imported water customers in the Santa Clara County portion of the GSP area along Pacheco Creek.

Valley Water's Board of Directors includes seven members, each elected from equally divided districts drawn through a formal process. The Board of Directors holds regular meetings twice monthly on the second and fourth Tuesday. All meetings are held in the Valley Water Headquarters Board Room, at 5700 Almaden Expressway, San Jose, unless otherwise noted on the meeting agenda.

1.4.1. Legal Authority of the GSA

SBCWD is a public agency overlying the North San Benito Basin within San Benito County. Valley Water is a public agency overlying portions of the basin in Santa Clara County. Both are qualified exclusive GSAs and have the authority to develop and implement SGMA within their respective service areas. Based on their respective legislation, each has broad powers and authorities for water management. SGMA specifies additional enabling powers; for example, GSAs may choose to adopt standards for measuring and reporting water use, develop and implement metering, and manage extraction from individual wells. GSAs also may impose fees to fund the cost of a groundwater sustainability program.

1.4.2. GSP Development Costs and Funding Sources

In November 2017, SBCWD applied for a Sustainable Groundwater Management Planning (SGMP) Grant to fund preparation of this GSP. In April 2018, DWR awarded SBCWD with full funding of $830,366. Subsequently in 2019, SBCWD GSA applied to DWR for additional grant funding as part of the 2019 Sustainable Groundwater Management Grant Program Planning – Round 3 Grant and in 2020 was awarded $1.17 million in grant funds. With SBCWD GSA cost sharing of $390,000, the total Round 3 project cost is $1.56 million. The Round 3 project, initiated in June 2020, involves three technical tasks: a program to site, design, and install dedicated monitoring wells, a feasibility investigation for Managed Aquifer Recharge (MAR), and two Annual Reports. These tasks supplement GSP preparation.

Implementation of the GSP will involve projects and management actions to maintain groundwater sustainability in North San Benito Basin. These are presented in Section 8 Projects and Management Actions. Estimated costs also are presented as available. Implementation of the GSP will involve increased annual costs for monitoring of the basin, compliance with SGMA monitoring requirements (including annual assessment of groundwater extraction), expanded reporting, and five-year updates.

Accordingly, as part of the GSP, SBCWD has investigated means of funding within its authority from the original San Benito County Water District Act and from SGMA. As detailed in Section 8, funding methods include a property-based fee for landowners in the basin benefitting from groundwater management and a potential groundwater-extraction based fee that supports annual measurement of groundwater pumping.

The costs of GSP preparation and implementation will be funded by the Groundwater Management Fee. In its Resolution No. 2021-13 (in Appendix A), the SBCWD GSA Board of Directors has determined that the amount of the Groundwater Management Fee is no more than necessary to cover the reasonable costs of the governmental activity financed thereby and that the manner in which those costs are allocated to landowners charged with the Groundwater Management Fee bears a fair and reasonable relationship to the owners' benefits received from management of the Basin.

As stated in Resolution No. 2021-13 and its Attachment A, the SBCWD GSA has identified the total costs of GSP preparation and the expected annual management and administration costs over the next five years, that the GSA adopts and levies and provides for the collection of the Groundwater Management Fee:

Table 1-2. Total GSP Plan Development and Annual Expense

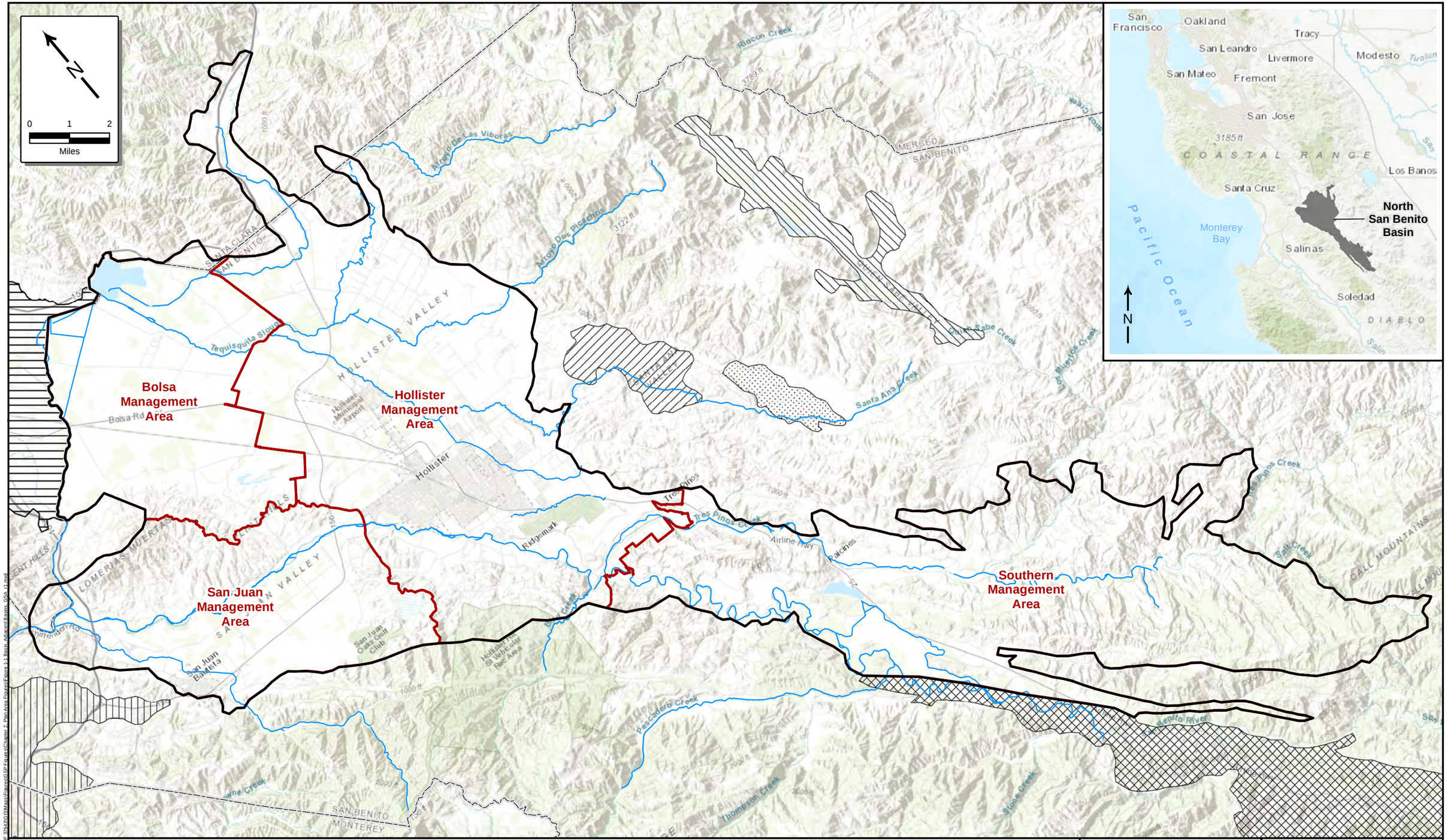
Fiscal year	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
Total Expense	$525,935	$539,401	$553,271	$567,557	$582,272

1.5. GSP ORGANIZATION

This GSP is organized generally to follow the Groundwater Sustainability Plan (GSP) Annotated Outline provided by DWR as one of its Guidance Documents. Major sections include:

- Executive Summary
- Introduction
- Plan Area
- Hydrogeologic Conceptual Model
- Groundwater Conditions
- Water Budget
- Sustainability Criteria
- Monitoring Network
- Management Actions and Projects
- Plan Implementation
- References

A Preparation Checklist demonstrating compliance with SGMA is attached in **Appendix C.** Additional appendices convey the Communication Plan (**Appendix D**); Technical Memoranda on data, the data management system, and management areas (**Appendix E**); Annual Reports (**Appendix F**); and Groundwater Model Update and Enhancement Report (**Appendix G**)**,** Dedicated Monitoring Well Installation Program Technical Memorandum (**Appendix H**), and List of Public Meetings and Comments on the Plan (**Appendix I**).

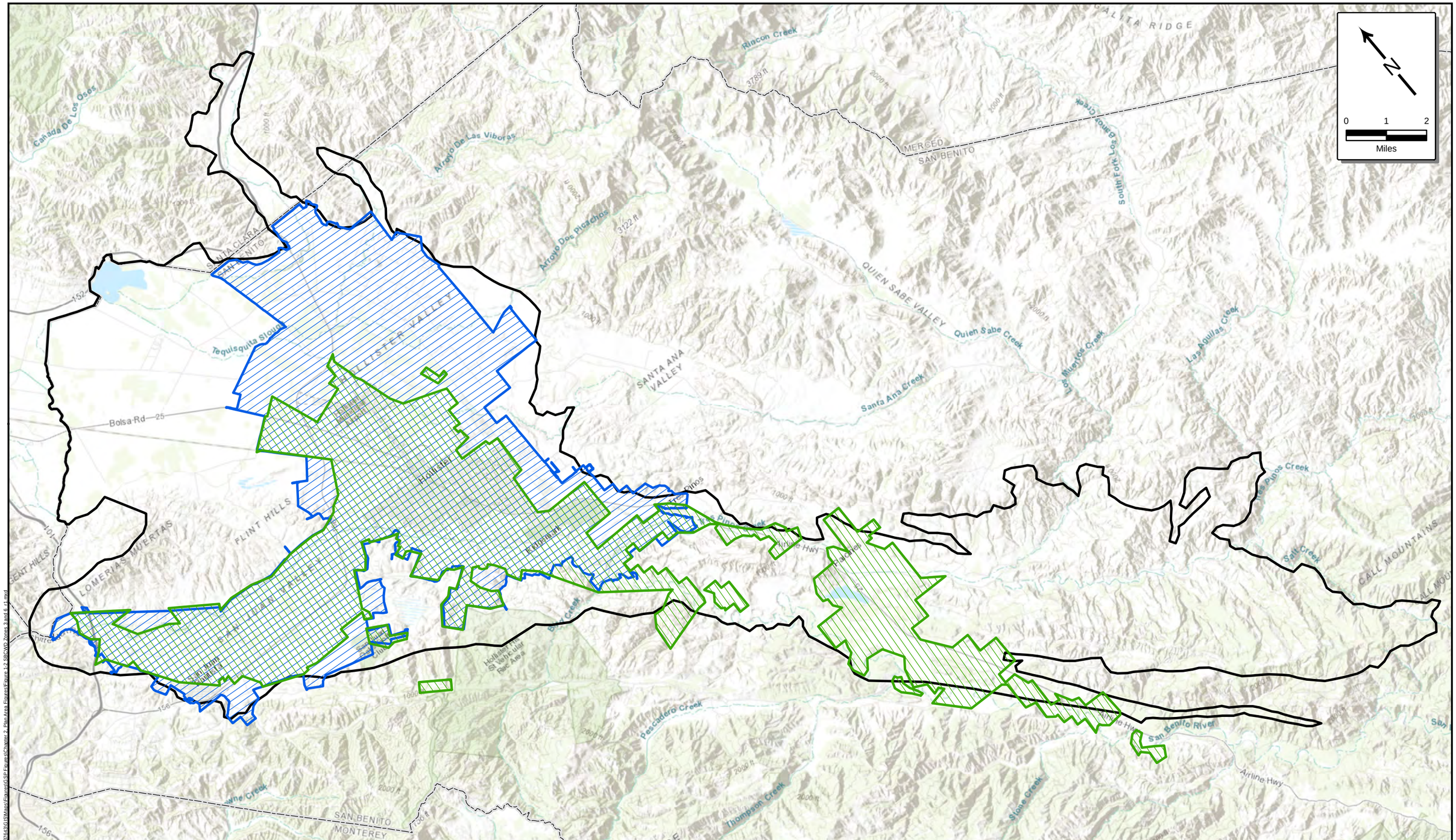


Llagas Area Subbasin of the Gilroy-Hollister Basin
Pajaro Valley Subbasin of the Corralitos Basin
Quien Sabe Valley Basin
Santa Ana Valley Basin
Upper Santa Ana Valley Basin
San Benito River Valley Basin
North San Benito Basin
Management Areas

November 2021

TODD GROUNDWATER

Figure 1-1
North San Benito Basin, Adjacent Basins, and SBCWD GSA



North San Benito Basin Zone of Benefit 1

San Benito County Water District (SBCWD) Zone of Benefit 3

San Benito County Water District (SBCWD) Zone of Benefit 6

November 2021

TODD GROUNDWATER

Figure 1-2
San Benito County Water District Zones of Benefit

2. PLAN AREA

The Plan Area includes valley areas characterized by productive agriculture, urban areas including the City of Hollister and the City of San Juan Bautista, rural communities, and upland areas characterized by grazing land.

2.1. DESCRIPTION OF THE PLAN AREA

The following provides a general description of the North San Benito Groundwater Sustainability Plan (GSP) Area, including local jurisdictions, water resource management and monitoring programs, well permitting procedures, general plans and other land use plans, and additional groundwater management elements.

2.1.1. Geographic Area

Figure 1-1 shows the boundaries of the Plan Area along with other groundwater basins in San Benito County. **Figure 1-1** also shows the adjacent Llagas Subbasin in Santa Clara County, which shares a common boundary along the Pajaro River, and the Pajaro Valley Basin which extends into San Benito County but is not adjacent to North San Benito.

Figure 1-1 shows the boundaries of Groundwater Sustainability Agencies (GSAs) in San Benito County; Valley Water is the GSA for all groundwater basin areas in Santa Clara County. No adjudicated areas exist in the basin, or in San Benito County and adjacent Santa Clara County. In addition, no areas of the North San Benito basin are covered by an Alternative Plan. Alternative Plans are equivalent to GSPs and represent options for basins with documented sustainability for the ten years but were due by January 1, 2017. Alternative Plans were submitted to California Department of Water Resources (DWR) by SCVWD (Valley Water) for the adjacent Llagas Subbasin and by Pajaro Valley Water Management Agency for the nearby Pajaro Basin.

2.1.2. Jurisdictional Agencies

This section identifies agencies with land use management responsibilities.

Counties. The GSP area overlaps two counties: San Benito and Santa Clara. Through the Resource Management Agency (RMA), San Benito County has jurisdiction for land use planning for unincorporated areas. San Benito County also has responsibility for small water systems and for on-site wastewater treatment systems (OWTS) through its Department of Environmental Health. The San Benito County Code of Ordinances (Title 15 Public Works, Chapter 15.05 Water, Article 1) also asserts groundwater aquifer protections and appoints San Benito County Water District (SBCWD) as the enforcing agency.

Similarly, the Santa Clara County Department of Planning and Development has jurisdiction for land use planning in unincorporated areas, including all Santa Clara County portions of the GSP Area. The Santa Clara Department of Environmental Health is responsible for small water systems and for OWTS. While Valley Water is responsible for regulation of the construction, destruction, and maintenance of wells, Santa Clara Department of Environmental Health provides review of all new well construction applications for domestic and agricultural uses prior to submittal to Valley Water; this review ensures adequate separation of wells from OWTS.

Cities. Figure 2-1 shows the boundaries of other jurisdictions that have land use management responsibilities. These include two municipalities: City of Hollister and the City of San Juan Bautista. These have land use planning responsibilities within their respective planning areas. General plan elements relevant to the GSP are discussed in Section 2.1.3. In addition to land use planning, the City of Hollister Public Works Department is responsible for stormwater management, for sewage collection, and for producing and distributing potable water for the western half of the City; the eastern portion of the City and the Ridgemark community are served by Sunnyslope County Water District (SSCWD). The City of San Juan Bautista provides water and sewer service within its service area.

State Parks. California State Parks has jurisdiction for the Hollister Hills State Vehicular Recreation Area (SVRA). Park facilities are mostly in Cienega Valley, but the eastern park overlaps the GSP Plan Area (see **Figure 2-1**). The overlapping portion of the SVRA is mostly designated as non-motorized special use area and buffer area and is open space with some ranch buildings. The Hollister Hills SVRA is guided by its Resource Management Plan and General Development Plan, completed in 1978 (California Department of Parks and Recreation, 1978). Planning relevant to water is generally to provide safe, serviceable water systems for picnic and camping areas; to protect habitat associated with seeps, springs, ponds, and riparian areas; and to control water pollution.

California Department of Fish & Wildlife. Also relevant are state wildlife refuges, lands owned by the California Department of Fish & Wildlife (CDFW), and lands with conservation easements. Of these in the GSP Area, the Wildlife Heritage Foundation/Wildlands manages the Pajaro River Wetland Mitigation Bank along the Pajaro River just downstream from San Felipe Lake.

Federal Lands. Federal lands within the GSP Area include parcels around and providing access to San Justo Reservoir. The reservoir is part of the US Bureau of Reclamation's Central Valley Project, and the land is administered by the Bureau of Land Management. No other federal lands overlie the Plan Area, such as military installations or United States Forest Service lands. No tribal lands are known within the GSP Area, but to the west, the U.S. Bureau of Indian Affairs administers an area of Tribal Trust Land along Harlan Creek, a tributary to Cienega Valley.

2.1.2.1. Water Supply Sources

Water supply for agricultural, Municipal and Industrial (M&I), and domestic uses is from groundwater, local surface water, imported water from the Central Valley Project (CVP), and recycled water; groundwater is the major source of supply.

Water Providers. While SBCWD and Valley Water have jurisdiction for water management throughout their respective counties, much of the population in the GSP area is served by local water agencies. The largest of these (in terms of permanent population) include the City of Hollister, Sunnyslope County Water District (SSCWD), Aromas Water District, City of San Juan Bautista, Tres Pinos Water District, and Community Service Area (CSA) No. 31-Stonegate Water System. Other small systems are operated by private mutual water companies and some communities do not have water purveyors and systems that provide water service. These small systems and communities—plus rural businesses, schools, parks, and residents—rely on private wells and groundwater.

- **City of Hollister.** The City of Hollister, a General Law City, is the largest incorporated city in San Benito County with a population of about 37,000. The City provides groundwater from four active production wells in the GSP Area, treated CVP water through the Lessalt and West Hills Water Treatment Plants (WTPs), and recycled water for non-potable uses.
- **Sunnyslope County Water District (SSCWD).** Sunnyslope County Water District is a special district in accordance with the California State Water Code. It is a water purveyor whose service

area includes part of the City of Hollister and unincorporated areas including the Ridgemark community. Serving a population over 20,000, SSCWD provides groundwater from five active wells located in the GSP Area and treated imported CVP water from the Lessalt WTP.

- **Aromas Water District.** Aromas Water District supplies groundwater to approximately 2,700 residents located in and around Aromas. While overlying a portion of the GSP Area, most of its customers and its three production wells are located outside the area.
- **City of San Juan Bautista.** The City of San Juan Bautista, a General Law City, serves water to a population of about 1,900 residents. The City operates four wells located within the GSP Area.
- **Tres Pinos Water District.** Tres Pinos Water District (TPWD) serves groundwater to the community of Tres Pinos, which has a population of about 500. TPWD has one active well.
- **CSA No. 31-Stonegate.** CSA No. 31 serves about 250 people in a residential community located along Pinnacles Highway. SBCWD provides Stonegate with CVP surface water and groundwater from one well that is located within the GSP Area.
- **Pacheco Pass Water District.** The service area of Pacheco Pass Water District (PPWD) is in the northern GSP Area along Pacheco Creek. PPWD owns and operates Pacheco Reservoir on North Fork Pacheco Creek in Santa Clara County. With a design capacity of 6,000 AF, the reservoir currently is operated by PPWD for groundwater recharge along the downstream creek channel. PPWD also holds surface water rights for impoundment along Arroyo de las Viboras and for diversion into the adjacent Frog Ponds for percolation.

Groundwater. Groundwater currently is the main source of water supply in the GSP Area. Groundwater provides supply to municipal, agricultural, and domestic users through an estimated 1,026 production wells located throughout the GSP Area (DWR, 2018b). The other major source is CVP water that is delivered to municipal water suppliers as noted above and to agricultural customers in Zone 6. In Zone 6, the relative proportions of groundwater and CVP water use are affected primarily by the availability of CVP water from USBR; in recent years, CVP supply has ranged from less than 20 percent to more than 50 percent of total Zone 6 supply.

Water Supply Wells. Figure 2-2 shows the density of water supply wells in and around the Plan Area; this map is based on the DWR Well Completion Report Map Application tool (DWR, 2018b). As indicated, the density of supply wells is generally less than 20 wells per section. Relatively high densities generally occur around the northern margins of the basin, in areas including low density residential development. **Figures 2-3**, **2-4**, and **2-5** show the estimated density of domestic wells, production wells, and public wells. Most of the production wells, as classified by DWR, are presumably irrigation wells but also include some industrial and commercial wells.

Beyond the service areas of the City of Hollister and SSCWD (Hollister and Ridgemark), and the Stonegate community, communities and rural residents depend on groundwater. The largest of the groundwater dependent communities in the GSP Area is the City of San Juan Bautista, where a population of about 1,900 depends solely on groundwater. Other communities depending on groundwater in the GSP Area include Tres Pinos (served by Tres Pinos Water District), Paicines, and Dunneville.

As shown in **Figure 2-6,** disadvantaged communities have been mapped in the area (DWR, DAC Mapping Tool). As of 2018, the DAC extending across San Juan Valley (mapped as census block groups) includes about 150 households / 660 persons. Households in this area rely on groundwater for domestic supply. Four smaller DAC areas are within the City of Hollister service area include over 3,300 households and a population of nearly 5,000. These DACs have access to City water supply, a blend of treated imported water and groundwater.

Local Surface Water. SBCWD owns and operates two reservoirs along the San Benito River. Hernandez Reservoir (capacity 17,200 AF) is located on the upper San Benito River in southern San Benito County. Paicines Reservoir (capacity 2,870 AF) is an offstream reservoir between the San Benito River and Tres Pinos Creek. It is filled by water diverted from the San Benito River, with some of the diversions consisting of natural runoff and some consisting of water released from Hernandez Reservoir. Water stored in the two reservoirs is released for percolation in Tres Pinos Creek and the San Benito River to augment groundwater recharge during the dry season. Zone 3 is the zone of benefit for local surface water (see **Figure 1-2)**.

Local surface water also is diverted from Arroyo de las Viboras into the adjacent Frog Ponds for percolation, based on PPWD surface water rights.

Pacheco Reservoir, owned by PPWD, is in Santa Clara County just north of the northernmost tip of the GSP Area. Water released from the reservoir flows down Pacheco Creek and provides groundwater recharge. In 2018, SCVWD (Valley Water) was awarded $484.5 million in funding from the State of California for the Pacheco Reservoir Expansion Project, which is a collaborative effort of SCVWD (Valley Water), SBCWD, and PPWD. The project includes construction of a new, larger reservoir and a pipeline providing a connection to the Pacheco Conduit, the CVP pipeline that delivers water into Santa Clara and San Benito counties from San Luis Reservoir. The expanded reservoir, when filled by a combination of Central Valley Project supplies and local inflows, would expand the storage of CVP water available to Valley Water and SBCWD, provide more flexibility for use of CVP water, enhance the continuity of flows in Pacheco Creek, and benefit downstream habitats along Pacheco Creek and the local steelhead population.

Imported Water. The Central Valley Project (CVP) is a Federal water system operated by the U.S. Bureau of Reclamation (USBR) with multiple uses including irrigation water supply for agricultural and urban uses, flood control, navigation improvement on the Sacramento River, water quality enhancement, hydroelectric power, fish and wildlife, and recreation. The CVP consists of 20 dams and reservoirs, 11 power plants, and 500 miles of major canals, conduits, and tunnels. While mostly serving the Central Valley, the San Felipe Division diverts water supply from San Luis Reservoir (shared with the State Water Project or SWP) through the Pacheco Tunnel and Pacheco Conduit to Santa Clara and San Benito counties. The Santa Clara Conduit conveys water to the Santa Clara Valley and the San Benito (Hollister) Conduit conveys water to San Justo Dam, an offstream storage reservoir in San Benito County.

SBCWD has a 40-year contract (to February 29, 2028, with options for renewal) for a maximum of 8,250 AFY of M&I water and 35,550 AFY of agricultural water. Actual CVP deliveries are modified on an annual basis by USBR, reflecting hydrologic conditions (e.g., drought), reservoir storage, and the environmental status of the Sacramento-San Joaquin Delta.

SBCWD distributes CVP water to agricultural, municipal, and industrial customers in Zone 6 through 12 subsystems containing approximately 158 miles of pressurized pipeline laterals (SBCWD, 2015). Zone 6, SBCWD's zone of benefit for CVP water, overlies northern portions of the GSP Area (see **Figure 1-2**). Such distribution of CVP water "in lieu" of groundwater pumping has been instrumental in reversing historical overdraft and preventing future overdraft. The Hollister Conduit, CVP distribution systems, and San Justo Reservoir (where CVP water is stored in the basin) is shown on **Figure 2-7**. SBCWD also has recharged groundwater with CVP water through offstream recharge ponds.

The City of Hollister and SSCWD purchase CVP water as the primary M&I CVP customers. Other M&I uses of CVP water include urban irrigation, golf courses, and potable supply for the Stonegate community. Treatment of CVP water for potable M&I supplies within the Hollister Urban Area (HUA) is provided by the Lessalt and West Hills Water Treatment Plants (WTPs) on the east and west sides of

Hollister, respectively. Lessalt WTP, a facility owned by SBCWD and operated by SSCWD, was placed into operation in 2003. An expansion was completed in 2015 that increased the operational capacity of Lessalt to 2.0 million gallons per day (MGD), treating an annual total of 2,240 AFY. West Hills WTP, with an initial design capacity of 4.5 MGD, began operation in late 2017. West Hills WTP not only provides additional treatment capacity for CVP water, but also improves the quality of water delivered on the west side. Together the WTPs enhance the reliability of HUA water supply, improve the water quality delivered to customers, and improve the quality of wastewater effluent and thereby support water recycling.

Recycled Water. Water recycling is a cooperative effort of SBCWD and the City of Hollister. Recycled water has been provided by the City of Hollister for landscape irrigation since 2010. As of 2016, SBCWD has been delivering recycled water from the City water reclamation facility for agricultural irrigation. Recycled water use is a relatively small but increasing supply.

2.1.3. Water Use Sectors

Water use sectors are defined in the GSP Regulations as categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation. In the GSP Area, these are summarized as follows.

- Urban water use sectors are focused in the City of Hollister and City of San Juan Bautista.
- Areas of industrial water use are mostly in the City of Hollister, with some in City of San Juan Bautista. Industrial sites in unincorporated San Benito County are generally near Hollister, but also include a light industrial park on Union Road west of Hollister and industry near the San Benito River at Highway 101.
- Agricultural land uses comprise extensive areas in the San Juan, Bolsa, Pacheco, Hollister, Tres Pinos, and Paicines valley areas.
- Managed wetlands include the Pajaro River Wetland Mitigation Bank (see **Figure 2-1**) that encompasses 273 acres of land along the Pajaro River south of San Felipe Lake and currently includes uplands, seasonal marsh, and semi-permanent emergent marsh habitat.
- Managed aquifer recharge is conducted by SBCWD along the channels of the San Benito River and Tres Pinos Creek and at offstream basins including the Union Road Pond near the San Benito River and the Frog Pond on Arroyo de Las Viboras (see **Figure 1-1** for stream locations).
- Native vegetation, including rangeland, accounts for the remainder including upland areas and along streams.

2.1.4. Water Resources Monitoring and Management Programs

This section summarizes water resources monitoring and management in the GSP Area as the foundation for GSP preparation and implementation. SBCWD has been managing water resources since its inception, has monitored groundwater levels since 1976, and since 1996 has provided summaries of its management and monitoring activities in its Annual Groundwater Reports (see **Appendix F** for recent reports). SBCWD also has conducted numerous special investigations over the decades; while these have contributed to the overall understanding and management of local water resources, they are not summarized here.

2.1.4.1. Water Resource Monitoring

Water resource monitoring programs considered in this section include:

- Climate

- Surface water flows
- Imported water deliveries
- Groundwater recharge
- Water recycling
- Land use and cropping
- Wells and groundwater pumping
- Groundwater levels
- Land subsidence
- Water quality.

Monitoring programs undertaken by local, state, and federal agencies are summarized below as they are relevant to the GSP. Much of this information is compiled regularly for the Annual Groundwater Reports.

Climate. Climate data are regularly compiled from DWR's California Irrigation Management Information System (CIMIS) and include total solar radiation, soil temperature, air temperature/relative humidity, wind direction, wind speed, and precipitation. Two CIMIS stations are active in the GSP Area, both of which also measure evapotranspiration (ETo):

- #126 San Benito, located at the SBCWD office on Mansfield Road with a record beginning in June 1994.
- #143, San Juan Valley, located at the San Juan Golf Course with a record beginning January 1998.

Historical rainfall data are available for Hollister dating back to 1874. For the Annual Groundwater Reports, historical annual precipitation has been compiled and reported using the Hollister rain gage for water years 1875-1995 and the CIMIS San Benito station thereafter (CIMIS, 2021).

Several maps are available showing the geographic distribution of annual rainfall across the GSP Area. These include the state-wide map by USGS (Rantz, 1969), which used data from 1907-1956; the SCVWD (Valley Water) map (SCVWD, 1989) that used data through 1988; and maps created using data from the Parameter-Elevation Regressions on Independent Slopes Model (PRISM) Climate Group (PRISM, 2021).

Surface water flows. Surface water monitoring has been summarized in Annual Groundwater Report and an appendix includes location maps of active and inactive USGS stations in and near the San Benito River system with the respective period of record (see Figures C-2 and C-3 in Todd Groundwater, 2018). Streamflow data are regularly downloaded. The sites for SBCWD miscellaneous surface water measurements are shown, including data from Pacheco Creek in Santa Clara County.

Imported water deliveries. Imported water deliveries began in September 1987 (LSCE, 1991). The Annual Groundwater Reports summarize annual CVP allocations, deliveries of CVP water to Zone 6, and San Justo reservoir water budgets. Delivery data are generated according to distribution subsystems; for historical reporting purposes, these data have been subsequently allocated to groundwater subbasins and to agricultural and municipal/domestic uses.

Groundwater recharge. The Annual Groundwater Reports summarize managed percolation activities. Information on SBCWD percolation of local surface water include annual reservoir budgets and releases for Hernandez and Paicines reservoirs. Percolation of CVP water also is tabulated, as is percolation of municipal wastewater from local wastewater treatment plants. In addition to regular monitoring, SBCWD also has conducted special studies of percolation along selected streams.

Recycled water. Recycled water use is documented in the Annual Groundwater Reports, with annual tabulation.

Wells and groundwater pumping. Groundwater pumping information is summarized in the Annual Groundwater Reports; this includes annual amounts from municipal providers (who measure groundwater production at least monthly).

Information also is provided on irrigation pumping in Zone 6, where SBCWD monitors groundwater pumping from major irrigation wells (with discharge pipes 3 inches in diameter or greater). Pumping amounts are calculated semiannually by metering the number of hours of operation and multiplying by the average discharge rate, which is measured a few times per year. This monitoring program began in about 1990 (soon after CVP imports started) and was based on recognition that CVP imports resulted in reduced pumping, increased recharge, and recovering groundwater storage with regional benefits. This contrasts with other California basins where imported water was used to increase irrigated acreage (LSCE, 1991). Irrigation pumping beyond Zone 6 is not monitored but has been estimated for regular water budget updates based on land use information and water use factors.

Groundwater levels. SBCWD has had a semi-annual groundwater level monitoring program since Water Year (WY) 1977; groundwater level data gathered by USGS and other agencies are available as early as 1913 (Clark, 1924). The Annual Groundwater Reports provide quarterly groundwater level data for each year. The data are the basis for groundwater level contour maps, change maps, hydrographs, groundwater level profiles, and storage change computations presented in the Annual Groundwater Reports. These are focused on Zone 6, where SBCWD delivers CVP water and maintains a relatively intensive monitoring program; the adjacent Bolsa area also is addressed. The SBCWD monitoring program includes wells in the Pacheco Valley in Santa Clara County. Valley Water's monitoring program provides data for the southern Llagas Subbasin; these shared data are used in the SBCWD annual groundwater level maps.

SBCWD is the designated California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring agency for the GSP Area; CASGEM data are available from DWR's online Groundwater Information Center Interactive Map (GICIMA).

Land use. Land use maps have been prepared by DWR for San Benito County, with the earliest maps in 1967. GIS-based land use maps are available online for 1997, 2002, and 2014 with the DWR Land Use Viewer (DWR, 2018a). In 2012, SBCWD prepared an update of the 2002 map to 2010 using 2010 aerial photography. The 1997 and 2002 maps were used in preparing the Salt Nutrient Management Plan (Todd, 2014) and in updating water budgets for the 2014 Annual Groundwater Report.

Land subsidence. While the potential for subsidence was recognized in the 2003 Groundwater Management Plan, it was not a known issue in the GSP Area and ground surface elevations were not tracked for this issue until DWR initiated its satellite mapping program in 2015. Nonetheless, groundwater levels generally have been managed to stay above historical low levels to minimize the potential for ground subsidence.

Water quality. In 1997, SBCWD initiated a program for monitoring nitrate and electrical conductivity (EC) in wells. In 2004, SBCWD established a comprehensive water quality database that contains over 450,000 records from water systems and regulated facilities. The database is updated on a triennial basis as part of the Annual Groundwater Reports with maps and data provided in an appendix. SBCWD surface water quality monitoring sites also are identified. Monitoring for the Salt Nutrient Management Plan is closely coordinated.

State-wide sources of groundwater quality data include the Water Data Library (WDL), Geotracker/ Groundwater Ambient Monitoring and Assessment (GAMA) program, and the State Water Resources Control Board's Division of Drinking Water (DDW). These are accessed for the triennial update of the SBCWD Water Quality Database.

2.1.4.2. Incorporation of Existing Monitoring into GSP

The monitoring program for the GSP is described in Section 7, Monitoring Network. The GSP Monitoring Network builds on existing monitoring programs that provide historical information and a context for future monitoring. It also includes an expansion to represent the entire North San Benito Basin. Data gaps have been defined throughout the GSP preparation process; an initial discussion of available data and data gaps was included in the December 2018 Technical Memorandum, "Data to Support GSP Preparation" (in **Appendix E**). Additional data and monitoring needs also have been identified in Sections 3 through 6 describing the Hydrogeologic Conceptual Model and Groundwater Conditions, quantifying the Water Budget, and setting Sustainability Criteria. These needs are addressed in Section 7. Objectives for the monitoring program, laid out in Section 7, provide guidance for the incorporation of existing monitoring into the GSP.

As described in Section 7, the existing monitoring programs will be enhanced and fully incorporated into the expanded monitoring program for GSP implementation. Monitoring data will be entered regularly into the Data Management System (DMS). The DMS in turn will: 1) provide data to inform and update the hydrogeologic conceptual model, water budget, and numerical model, 2) provide tracking and early warning regarding groundwater conditions and undesirable results, and 3) demonstrate progress toward and achievement of sustainability. As described in the 2020 Annual Groundwater Report (in **Appendix F**), the SBCWD annual reporting already has been transitioning in content and format toward a SGMA-compliant annual report. Additional details are provided in the next section, 2.1.4.3 Water Resources Management.

2.1.4.3. Water Resources Management

This section describes the water resources management plans developed by SBCWD for the Plan Area; note that monitoring is addressed in Section 2.1.2.1.

Groundwater Management Plan, 1998 and 2003. The groundwater management planning process in San Benito County was initiated in May 1997 as a collaborative effort among local water agencies and other organizations. The involved water agencies included the Aromas Water District, City of Hollister, City of San Juan Bautista, SBCWD, SSCWD, and TPWD. The other cooperating organizations included San Benito County, San Benito County Farm Bureau, San Benito County Builders and Developers Association, Granite Rock Company and the Sierra Club. This collaboration resulted in the Groundwater Management Plan for the San Benito County Part of the Gilroy-Hollister Groundwater Basin (JSA, 1998) which was adopted on April 29, 1998, pursuant to Water Code Appendix Section 70-7.

The 1998 Groundwater Management Plan addressed San Benito County portions of the Gilroy-Hollister Basin and extended southward to include the Tres Pinos Valley Basin. The 1998 plan summarized the local hydrogeology, water budgets, water quality, water supply and demand, and regulatory setting. It developed management objectives, identified issues, and presented 32 management actions with an implementation plan.

Recognizing that groundwater management is an ongoing process that is best accomplished on a collaborative basis, four key agencies (SBCWD, City of Hollister, City of San Juan Bautista, and SSCWD) formalized their relationship in June 1998 as the Water Resources Association (WRA) of San Benito

County. This association was granted the power to coordinate the study and planning of water programs, to undertake studies and programs to implement the groundwater plan, and to update the Groundwater Management Plan.

Accordingly, the WRA embarked on a process of expanding the groundwater management plan and developing an associated program environmental impact report (PEIR) to inform decision makers and the general public of the environmental effects that might result from approval of the plan. SBCWD served as the lead agency in this effort, which culminated in the August 2003 Groundwater Management Plan (GWMP) Update for the San Benito County Portion of the Gilroy-Hollister Groundwater Basin (Kennedy/Jenks, 2003). The GWMP Update and PEIR were approved by SBCWD on July 28, 2004.

The 2003 Update focused on northern portions of the Gilroy-Hollister basin in San Benito County. It described groundwater basin conditions, defined basin management objectives, identified nine major issues, and presented numerous management elements. Overall, it provided the basis for subsequent activities and related management planning, including:

- Urban water conservation and agricultural irrigation efficiency programs
- Salt and nitrate management programs (e.g., water softener rebate program)
- Enhancement of data management and monitoring programs (e.g., dedicated monitoring well and water quality database)
- Update and application of regional groundwater flow model
- Surface water importation
- Water transfers and banking
- Management of groundwater recharge operations
- Surface water treatment (e.g., Lessalt and subsequent West Hills Plants)
- Management of municipal wastewater percolation and water recycling.

Most of these have been cooperative efforts involving multiple agencies.

Numerical Groundwater Modeling. In 2001, SBCWD developed a groundwater flow model of the San Benito County part of the Gilroy-Hollister Groundwater Basin. The model has been applied for various water and wastewater planning, design, and environmental impact studies since then. The updated model is described in **Appendix G**. It has evolved "organically," with incremental addition of new features and localized recalibration to meet the needs of individual studies. Examples of these enhancements include the addition of particle-tracking to estimate subsurface travel time of percolated wastewater, linking of the flow model to a solute transport model to simulate salt accumulation and movement in groundwater, and expansion of the simulated flow domain to include some of the hills adjacent to the valley floor areas.

In 2015, a systematic update and enhancement of the groundwater model and the pre- and post-processing programs was conducted (Todd, 2015). This overhaul included:

- Extending the simulation base period by 10 years, to cover water years 1975-2014.
- Replacing the previous set of spreadsheet tools for estimating rainfall recharge, irrigation pumping and return flow, and stream flow with a more flexible and integrated set of spreadsheets and Fortran programs that better represent surface hydrologic processes.
- Eliminating data-preparation procedures that had been introduced for specific past projects but were deemed not necessary for current and future model applications.
- Adding the capability to easily simulate evolving land use or incorporate variable stress period durations.

Integrated Regional Water Management Plan, 2007. The IRWMP is a collaborative effort by the Pajaro Valley Water Management Agency (PVWMA), SBCWD, and SCVWD (Valley Water) to identify regional and multi-benefit projects for the Pajaro River Watershed. Adopted in 2007 (SBCWD et al., 2007), the IRWM Plan describes the region, provides goals and objectives, and identifies and evaluates projects and programs, including assessment of climate change. On an individual basis, PVWMA, SBCWD, and Valley Water have each investigated and evaluated various resource, environmental, and management options for the overall health and well-being of the watershed within their jurisdictions. The IRWMP integrates these various efforts and investigates the greater Pajaro River Watershed area to identify and prioritize integrated regional projects for the watershed to maximize benefits to the broadest group of stakeholders in the region. A major component of the IRWMP has been the Hollister Urban Area (HUA) water and wastewater master planning process, summarized below.

Hollister Urban Area Water Project. The Hollister Urban Area Water Project (HUAWP) is an ongoing collaborative effort by the City of Hollister, SBCWD, and SSCWD to improve drinking water quality for residents and businesses and to help meet wastewater discharge requirements and protect the groundwater basin. The area of the HUAWP includes the City of Hollister and nearby unincorporated areas of San Benito County designated for urban development (HUAWMP, 2017).

This effort was initiated in 2004 with an MOU among the three entities to develop the HUA Water and Wastewater Master Plan (HDR, 2008), which identified projects or program elements for water, wastewater, and recycled water with implementation defined out through 2023. The HUA water projects have included: (1) purchases or transfers of imported water supplies, (2) North County Groundwater Bank, (3) new urban wells, (4) upgrade of the Lessalt Water Treatment Plant, (5) new surface water treatment plant [West Hills], (6) demineralization of urban wells, (7) a new pipeline to Ridgemark, and (8) new treated water storage. Wastewater elements include (1) Ridgemark Wastewater Treatment Plant upgrades, (2) expansion of the City of Hollister Water Reclamation Facility, and (3) the Cielo Vista Estates connection to the City of Hollister Water Reclamation Facility. Recycled water elements include (1) Phase 1 recycled water facilities (2) Phase 2a and Phase 2b recycled water facilities, and (3) Ridgemark recycled water facilities. Non-structural solutions include water conservation, salinity education, water softener ordinance, new development connections to the city sewer, and other measures.

Salt and Nutrient Management Plan (SNMP), 2014. SNMPs are required for groundwater basins throughout California and are intended to help streamline permitting of new recycled water projects while ensuring attainment of water quality objectives and protection of beneficial uses. The San Benito SNMP (Todd, 2014) was developed in accordance with the Recycled Water Policy adopted by the California State Water Resources Control Board. The San Benito SNMP addresses the Bolsa, Hollister, San Juan Bautista, and Tres Pinos Valley groundwater basins as defined by DWR. It includes:

- Definition of water recycling goals and objectives
- Identification of salt and nutrient sources
- Estimation of the salt and nutrient loading to groundwater basins and their capacity to assimilate the additional loading
- Development of salt and nutrient loading mitigation strategies
- Improvement of ground water quality monitoring.

The SNMP provides projected salt/nutrient balances for twelve subareas and found that all but two (Bolsa and Tres Pinos Valley) have predicted stable or decreasing trends in total dissolved solids (TDS) concentrations. Most areas had predicted increasing trends in nitrate concentrations in groundwater,

but predicted increases are small. Potential adverse water quality impacts of recycled water irrigation projects were found to be minimal, and in some cases, impacts were positive.

Agricultural Water Management Plan (AWMP), 2015. SBCWD has prepared AWMPs in compliance with Water Code Section 10826. The AWMP (SBCWD, 2015) provides a description of SBCWD, the agricultural water supplier, its Zone 6 service area for CVP supply, and local conveyance, storage, and distribution facilities. The AWMP also documents the quantity of water used for agricultural irrigation, recreational purposes (e.g., at San Justo Reservoir until closed in 2008 due to Zebra Mussel infestation), and municipal / industrial purposes. Groundwater recharge operations and transfers/exchanges also are summarized. Water supplies are documented, and the reliability of water sources is assessed, including consideration of climate change. The AWMP presents SBCWD's implementation of efficient water management practices.

Irrigated Lands Regulatory Program (ILRP). The Irrigated Lands Regulatory Program (ILRP) of the Central Coast Regional Water Quality Control Board (RWQCB) regulates waste discharges from irrigated lands through its Waste Discharge Requirements (WDRs) including Order No. R3-2012-0011 for Discharges from Irrigated Lands (Agricultural Order), and Monitoring and Reporting Program Order Nos. R3-2012-0011-01, R3-2012-0011-02, and R3-2012-0011-03 (MRPs). In response, the Central Coast Groundwater Coalition (CCGC) was founded in July 2013 to represent landowners and growers who operate in Monterey, San Benito, Santa Clara, Santa Cruz, San Luis Obispo and Santa Barbara counties, and the northern portion of Ventura County. CCGC is a non-profit organization whose primary function is to fulfill groundwater quality regulatory requirements in the ILRP of the RWQCB.

CCGC developed a plan for groundwater monitoring that was approved by RWQCB in July 2013. A key component of the plan is sampling of drinking water wells with a focus on nitrate. In June 2015, CCGC submitted to a groundwater characterization report (LSCE, 2015) for the northern counties, including the Salinas, Pajaro, and Gilroy-Hollister valleys. This report, documenting nitrate concentrations in groundwater, was approved by the RWQCB in 2015. Subsequent sampling was scheduled for 2017 and 2019.

Water Quality Control Plan for the Central Coast Basins. The Water Quality Control Plan for the Central Coastal Basin (Basin Plan) provides the framework for how surface water and groundwater quality in the Central Coast Region should be managed to provide the highest water quality reasonably possible. The Basin Plan lists beneficial uses, describes the water quality which must be maintained to allow those uses, provides an implementation plan, details State Water Resources Control Board (SWRCB) and RWQCB plans and polices to protect water quality, and presents surveillance and monitoring programs. The most recent update in 2017 presents revised Total Maximum Daily Loads (TMDLs) for nitrogen compounds and orthophosphate in streams of the Pajaro River Basin, including the Pajaro River, San Juan Creek, and Tequisquita Slough of the GSP Area.

Urban Water Management Plans (UWMPs). The California Urban Water Management Planning Act requires preparation of UWMPs by urban water providers with 3,000 or more connections. The UWMPs, generally required every five years, provide information on water supply and water demand—past, present, and future—and allow comparisons as a basis for ensuring reliable water supplies. UWMPs examine water supply and demand in normal years and during one-year and multi-year droughts. UWMPS also provide information on per-capita water use, encourage water conservation, and present contingency plans for addressing water shortages. UWMPs have been prepared for the Hollister urban area since 1991; the most recent was a joint effort of City of Hollister, SBCWD, and SSCWD (Todd, 2021). Much of the coordination and community participation regarding water conservation within the HUA is

achieved through the Water Resources Association (WRA) of San Benito County, which serves water customers of Hollister, SSCWD, SBCWD, and the City of San Juan Bautista.

According to the 2021 UWMP, total water demand will increase as population grows, but per-capita water demand has been responsive to water conservation efforts and has successfully met State guidelines. Water demands are satisfied with a combination of local groundwater and imported CVP water. Construction of water treatment plants as part of the HUA Water Project allows direct use of imported water, which improves delivered water quality, conserves groundwater for use during drought, and improves wastewater quality and thereby supports water recycling.

Despite challenges of drought, climate change, and environmental and legal factors, the HUA agencies have been able to provide reliable supply. This has been achieved by actively managing the portfolio of water supplies (groundwater, imported water, recycled water), by improving facilities (e.g., water treatment plants), and by promoting conservation.

SBCWD Annual Groundwater Reports. The San Benito County Water District Act authorizes the SBCWD Board of Directors to require SBCWD staff to prepare an annual groundwater report; this report addresses groundwater conditions and the zones of benefit for the water year. The Board has consistently ordered preparation of Annual Reports, and the reports have included contents specified in the Act:

- An estimate of the annual overdraft for the current water year and for the ensuing water year
- Information for the consideration of the Board in its determination of the annual overdraft and accumulated overdraft as of September 30 of the current year
- A report as to the total production of water from the groundwater supplies of the District and its zones as of September 30 of the current year
- Information for the consideration of the Board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the District and its zones
- The amount of water the District is obligated to purchase during the ensuing water year
- A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the District and its zones during the ensuing water year
- A recommendation as to whether or not a groundwater charge should be levied in any zone(s) of the District in the ensuing water year and if so, a rate per acre-foot for all water other than agricultural water for such zone(s)
- Any other information the Board requires.

Annual Groundwater Reports generally provide information on a Water Year basis (October 1-September 30) with completion of the report in December of that year and presentation at a Board of Directors meeting on the second Monday of the following January.

The Annual Groundwater Reports have served for decades as a reliable “state of the basin” report. The Annual Groundwater Reports also have been used to conduct and summarize selected groundwater investigations, for example addressing issues such as water quality, salt loading, shallow wells, and others. In recent years, water balance and water quality updates have been provided on a triennial basis. Recent Annual Reports are provided on the SBCWD website. The Annual Groundwater Reports for 2015, 2016, 2017, 2018, 2019, and 2020 are in **Appendix F.** The 2021 Annual Groundwater Report, completed after GSP submittal in January 2021, will be available on the SBCWD website.

Adaptation of Existing Monitoring and Management to SGMA. SBCWD has been actively monitoring and managing water resources throughout the GSP Area for decades. This management generally has been successful, especially where supplemental surface water supplies have been developed and where zones of benefit—namely Zone 3 and Zone 6—have been established. Some considerations for adaptation to SGMA include:

- Compliance with SGMA will require extension of monitoring and management activities to encompass all areas within the DWR-defined basin boundaries.
- As described in **Appendix G**, the numerical model was updated to include 2015 and recently available data, expanded to encompass the entire GSP area, and modified to address issues and specific sustainability criteria.
- Some adaptations may be considered about the timing of activities during the year. For example, historical computation of storage change has been based on autumn conditions, while SGMA requires analysis of seasonal high and low conditions.
- SBCWD Annual Groundwater Reports have specific content and timing; SBCWD has been considering how best to effectively fulfill requirements of Annual Reports (as ordered by the Board) and SGMA.
- Monitoring and management activities have addressed groundwater management issues as defined at the time; compliance with SGMA will involve re-visiting issues with the procedures laid out in the GSP Requirements.

Existing monitoring and management on the North San Benito Basin have been conducted by SBCWD in collaboration with Valley Water and public agencies in San Benito County. GSP implementation is built on, incorporates, and often expands existing programs, which thus are not expected to limit operational flexibility.

2.1.5. General Plans, Land Use Planning, and Well Permitting

This section presents relevant elements of General Plans and other land use planning in the GSP Area as relevant to groundwater sustainability. It summarizes the goals, objectives, policies, and implementation measures as variously described in the General Plans for San Benito County, Santa Clara County, City of Hollister, City of San Juan Bautista, and Hollister Hills SVRA which together encompass the GSP Area. This section also summarizes local well permitting procedures and well ordinances.

2.1.5.1. Land Use

The GSP area includes highly developed agriculture on prime farmland, mostly in valley areas, and rangeland with some vineyards on surrounding hills.

Figure 2-8, Important Farmland, provides an overview of land uses in the GSP Area that emphasizes the importance of local agriculture. The California Department of Conservation, Farmland Mapping and Monitoring Program identifies lands that have agricultural value and maintains a statewide map in its Important Farmlands Inventory (IFI). IFI classifies land according to its productive capabilities, which is based on many characteristics, including fertility, slope, texture, drainage, depth, salt content and availability of water for irrigation. Farmland categories are based on their suitability for agriculture:

> **Prime Farmland.** This land has the best combination of physical and chemical characteristics for crop production. When treated and managed, its soil quality, growing season, and irrigation supply produce sustained high crop yields.

Unique Farmland. This land does not meet the criteria for Prime Farmland or Farmland of Statewide Importance but has produced specific crops with high economic value.
Farmland of Statewide Importance. This is land that does not qualify as Prime Farmland but has a good combination of irrigation and physical and chemical characteristics for crop production.
Farmland of Local Importance. This land is either currently producing crops or has the capability to produce crops but does not meet the criteria above.
Grazing Land. This is land with vegetation that is suitable for grazing livestock.

Other lands include semi-agricultural land and rural commercial land.

Figure 2-9 documents land use as mapped by DWR in 2014 (DWR, 2018a). As shown, the GSP Area is characterized by extensive truck crops with areas of grain and hay, vineyards, and deciduous fruits and nuts. Urbanization is mostly in the Hollister-Ridgemark and San Juan Bautista areas.

2.1.5.2. General Plans

Land use planning within the GSP Area is guided by the General Plans for San Benito County, Santa Clara County, City of Hollister, and City of San Juan Bautista.

San Benito County General Plan. The San Benito County General Plan, adopted in 2015, states that water is a critical resource for San Benito County's economy and residents (EMC Planning, 2015). Of the three main sources (groundwater, Central Valley Project, and local surface water), groundwater is recognized as the largest source of water used in the county. The General Plan recognizes that such a valuable resource must be appropriately planned and managed and acknowledges SBCWD as having jurisdiction over water management throughout the County.

The San Benito County 2035 General Plan provides a summary of 21 Guiding Principles. One of these is to encourage new growth in communities that are clustered to preserve prime farmland and rangeland, protect natural habitats, and reduce impacts of urban sprawl. The County General Plan presents four New Community Study Areas: Bolsa, Fairview, San Juan, and Union. These broad areas are presented as opportunities for the County to accommodate some future growth in new unincorporated communities, although new community proposals are not limited to the Study Areas. The General Plan indicates that New Communities are typically master-planned communities, but also states that proposals would be considered on a case-by-case basis.

Another principle is to ensure that agriculture and agriculture-related industries remain a major economic sector. In fact, the General Plan has a strong statement that the County is determined to protect and support the agricultural and ranching industries in the county. This determination is expressed in part through identification of a Wine/Hospitality Priority Area, where activities related to the wine industry are encouraged including vineyards, wineries, tasting rooms, hotels, restaurants, stores, and processing facilities.

Regarding water resources, other guiding principles encourage future growth near available water and sewer infrastructure and encourage future growth that can be supported by adequate, long-term access to water. Guiding principles also call for protection of natural resources and open space areas from incompatible uses, and for preservation of the county's environmental quality and diverse natural habitats. A final guiding principle is to coordinate County planning efforts with those of the City of Hollister and the City of San Juan Bautista.

Figure 2-10 shows general Land Use Planning Designations of the San Benito County General Plan throughout the GSP Area. As indicated, broad areas are designated as agriculture and rangeland; urban uses are mostly within city spheres of influence.

Relevant land use planning goals and policies are summarized in **Table 2-1**, located at the end of this section**.** This table is a summary and may not include all General Plan policies relevant to the GSP; accordingly, specific issues will likely involve consultation with Planning Department staff. **Table 2-1** also indicates how the County will implement policies and programs; this is accomplished in the General Plan through reference to eight categories of implementation:

- Regulation and Development Review (RDR)
- Infrastructure and Service Master Plans, Strategies, and Programs (MPSP)
- Financing and Budgeting (FB)
- Planning Studies and Reports (PSR)
- County Services and Operations (SO)
- Inter-Governmental Coordination (IGC)
- Joint Partnerships with the Private Sector (JP)
- Public Information (PI)

Two ongoing implementation programs for the Public Facilities and Services element of the General Plan are the following:

- **PFS-E: Groundwater Monitoring Program.** The County shall work with water purveyors, groundwater basin managers, and willing landowners to improve groundwater monitoring including quality, yields, and groundwater elevations. This should include identifying monitoring sites, installing monitoring wells, identifying gaps in the monitoring network, establishing monitoring protocols and developing a groundwater budget. This implements Policy PFS-4.1; the responsible department is the Environmental Health Division, supported by Planning and Building Inspection Services.
- **PFS-F: Regional Planning Group.** The County shall participate in regional water, wastewater, and watershed planning groups designed to discuss and solve water supply, water quality, watershed, and other water/wastewater-related issues within the county, and to identify and pursue alternative funding sources for future projects. This implements Policies PFS-4.1 through PFS-4.8, and PFS-5.1 through PFS-5.6; the responsible department is the Environmental Health Division, supported by Public Works.

Santa Clara County General Plan. Figure 2-11 is the 2013 Santa Clara County Land Use Plan. The Santa Clara County General Plan, adopted in 1994, is organized into two parts; Book A presents county-wide issues and policies, and Book B focuses on rural areas. Both are relevant to those portions of the Plan Area that extend into Santa Clara County. This discussion focuses on the Resource Conservation section of Book A, particularly the section on Water Supply Resources, but acknowledges that strategies and policies relevant to groundwater may be presented in other parts of the General Plan.

The Santa Clara County General Plan presents goals for responsible resource conservation; goals particularly relevant to groundwater sustainability include:

Water Supply Resources Conserved and Protected

- An adequate supply of high quality water to meet domestic and economic needs.
- Water resources used efficiently and protected from contamination, particularly water supply watersheds and groundwater aquifers.

Special Water Environments Protected and Restored

- Healthy, well-functioning creek, streamside, Bay, and Bay wetlands ecosystems capable of providing stable wildlife habitat, corridors linking habitat areas, and protection for endangered species; passive recreational and interpretive nature study; and aesthetic enhancement of urban and rural settings.

Table 2-2 (located at the end of this section) summarizes selected strategies, policies, and implementation measures from the Water Supply Resources, Water Quality and Watershed Management, and Safety and Noise/ Waste Water Disposal sections. **Table 2-2** also presents selected water supply, water quality, and Development Hazards/Environmental Safety policies from the South County Joint Area Plan. As a summary, this table does not include all policies relevant to the GSP and some issues may require consultation with County planning staff.

City of Hollister General Plan. The City of Hollister General Plan (Moore lacofano Goltsman, 2005) was adopted in 2005 and subsequently amended in 2007. It is being updated as of 2020. **Figure 2-12** shows the planning area that surrounds the City of Hollister and includes portions of the GSP area.

Goals, policies, and implementation measures with relevance to groundwater sustainability are summarized in **Table 2-3** (located at the end of this section). Implementation measures are listed with each goal; these are one-sentence summaries with a designation (e.g., H.B) and each General Plan element (e.g., Housing) provides a detailed discussion of each measure. As a summary, this table may not include all relevant General Plan policies and specific issues may arise that will likely involve consultation with City planning staff.

City of San Juan Bautista General Plan. The City of San Juan Bautista General Plan was adopted in 2015 (Cal Poly CRP, 2015). **Figure 2-13** shows the planning area, sphere of influence, and area of concern that surround the City of San Juan Bautista and overlap portions of the GSP area.

Goals, objectives, policies, and programs with specific relevance to groundwater sustainability are summarized in **Table 2-4**, drawing from the Land Use, Conservation, Open Space, Public Facilities and Services, and Health elements of the General Plan. This table may not include all relevant policies and specific issues will likely involve consultation with City planning staff.

2.1.5.3. General Plan Influences on GSA Ability to Achieve Sustainability

Land use planning could affect the ability of the GSA to achieve sustainable groundwater management over the planning and implementation horizon. This would occur chiefly by land use planning agencies allowing or promoting land use development (agricultural, urban, or rural) in the basin or watershed with net increases in water demand that challenge the GSAs' ability to secure water supply in a timely or cost-effective manner. Such potential challenges are being addressed by the GSAs with transparent reporting on GSP preparation and implementation and active outreach to and collaboration with agencies that have land use planning roles. The General Plans of major agencies are discussed below with regard to water management.

San Benito County. The San Benito County General Plan addresses the importance of groundwater and acknowledges SBCWD as having water management jurisdiction throughout the County. The General Plan also restates the California Water Code requirements for developments to prepare Water Supply Assessments. However, review of the goals in **Table 2-1** indicates an emphasis on needed future growth and on needs of existing and future agriculture and development. The policies and implementation of the land use and public facilities/services elements indicate that the County role is only to support and

encourage SBCWD and local water agencies in ensuring that water supply is available. Similarly, with wastewater issues and protection of water quantity and quality, the County role is limited to encouragement of other agencies, developers, and landowners. The General Plan contains little policy to manage land use within the constraints of available water supply.

Santa Clara County. Review of **Table 2-2** summarizing the Santa Clara County General Plan and South County Plan indicates that the County is proactive in water management. The strategies, policies, and implementation measures are coordinated with the overall water supply planning of Valley Water to maximize long term dependability of water supply. Most importantly, the General Plan states clearly that land use and growth management planning should be coordinated with water supply planning; this is an important distinction from general plans that emphasize land use planning and growth and then place the responsibility for water supply on water agencies. Given the historical and ongoing collaboration between Valley Water (SCVWD) and SBCWD, the relevant Santa Clara County general plans and GSP are mutually supportive.

City of San Juan Bautista. The City of San Juan Bautista serves a population that is predicted to increase from 1,862 in 2010 to about 2,105 residents by 2035 (Cal Poly CRP, 2015). While State housing mandates are larger and present a challenge, the General Plan indicates that growth can be accommodated within the City with smart growth, that local groundwater is sufficient, and that water resources can be kept for surrounding agriculture. In recent years, water issues for the City have mostly concerned water quality; to provide residents with good quality water now and in the future, the City has recently constructed two new wells. City land use policies generally are protective of agricultural land and hillsides, and conservation policies address water efficiency, water recycling, sustainability measures, and coordination with other agencies including WRA and San Benito County. The City of San Juan Bautista General Plan and GSP are compatible.

City of Hollister. The City of Hollister is the County Seat and the largest city in San Benito County. In the 1990s, the City experienced rapid growth resulting in loss of agricultural land and severe constraints on City infrastructure, including wastewater capacity issues. Subsequently in 2002 Hollister voters enacted a growth cap of 244 homes per year. For planning purposes, the 2020 UWMP estimates City growth from 25,963 in 2020 to 49,978 in 2040 (Todd, 2021); these population values were used in the 2015 UWMP, prepared by City of Hollister, SBCWD, and SSCWD. As summarized in the UWMP, the City has reliable supply (assuming continued availability of imported water) and moreover, the three HUA agencies are collaborating closely on water and wastewater issues. With this coordination, which is specified in the City General Plan, the Hollister General Plan and GSP are compatible and mutually supportive. The Hollister General Plan is being updated as of 2020.

2.1.5.4. GSP Influences on General Plans

GSP implementation generally will occur as an extension and expansion of existing management, which has been responsive to growing demands for water while protecting groundwater resources and beneficial uses of groundwater. The GSP provides background information on groundwater conditions and quantitative criteria for the sustainability criteria relative to levels, storage, subsidence, groundwater quality, and interconnected surface water and groundwater dependent ecosystems (GDEs). The GSP will be informative to land use planners through monitoring, regular reporting, and management actions (including some scientific investigations) that could affect land use planning and environmental assessments.

City of San Juan Bautista. Implementation of the GSP will support the City of San Juan Bautista in providing good quality water in sufficient quantities to serve its residents into the future, including

drought periods. In light of historical water resources management by SBCWD, the GSP will be supportive of City of San Juan Bautista policies regarding water conservation, water recycling, other sustainability measures, and inter-agency cooperation.

City of Hollister. Implementation of the GSP will support the City of Hollister in providing good quality water in sufficient quantities to serve its residents into the future, including drought periods. In light of historical water resources management by SBCWD, the GSP will be supportive of City of Hollister policies regarding water conservation, water recycling, other sustainability measures, and inter-agency cooperation.

Santa Clara County. Implementation of the GSP will support Santa Clara County in its land use planning that prioritizes water supply and incorporates cooperation with Valley Water.

San Benito County. The San Benito County General Plan generally assumes that local water agencies can ensure adequate high-quality water supplies into the future. The GSP provides additional, specific information, documents potential challenges to water supply, and explores undesirable results that may occur with future agricultural expansion and rural development. Undesirable results will be defined with sustainability criteria, and if identified, will be addressed with management actions. These management actions may have ramifications for County land use planning. For example, GSPs are authorized within the GSP Plan Areas to impose well spacing requirements and control groundwater pumping and control extractions by regulating, limiting, or suspending extractions from individual groundwater wells. Such regulation may present a constraint on potential land uses.

2.1.5.5. Well Permitting

In San Benito County, permitting of wells (including new, replacement, cathodic, and geothermal wells) is administered by SBCWD; well permit forms are provided, and procedures are described on the SBCWD website. The process includes an application by the property owner and certified well driller, a site inspection by SBCWD, and an annular well seal inspection by SBCWD. Timely submittal of a Well Completion Report is required. SBCWD also requires registration of a water producing facility. Well standards are DWR California Well Standards, Combined.

In Santa Clara County, any person planning to dig, bore, drill, deepen, modify, repair, or destroy a water well, cathodic protection well, observation well, monitoring well, geothermal heat exchange well, exploratory boring, or other deep excavation intersecting groundwater must first obtain a permit from Valley Water. The well permitting process is described on the Valley Water website and forms are provided. Valley Water regulates the construction and destruction of wells based on its Standards for the Construction and Destruction of Wells and Other Deep Excavations in Santa Clara County and on the California Well Standards.

2.1.6. Additional GSP Elements

The California Water Code contains a checklist for preparation of GSPs, which provide groundwater management elements that may be applicable for incorporation into the North San Benito GSP. Most management programs relevant to this checklist are described in Section 2.1 above; programs are summarized below for each topic to ensure that the additional plan elements listed in the GSP regulations (Section 354.8 (g)) have been considered.

a) *Control of saline water intrusion.* Seawater intrusion is not applicable because this is not a coastal basin.

b) *Wellhead protection areas and recharge areas.* Section 2.1.2.1 introduces major water providers, most of whom have production wells. **Figure 2-5** shows the areas with public wells in terms of density. Recharge areas are discussed in Section 3.10.

c) *Migration of contaminated groundwater.* Regulated facilities with soil and groundwater contamination are described in Section 4.6.1 and shown on **Figure 4-17**. RWQCB files for such facilities have been and will continue to be checked regularly as part of the SBCWD water quality monitoring program.

d) *Well abandonment and well destruction program.* Well permitting, including well abandonment and destruction, is discussed in Section 2.1.5.5.

e) *Replenishment of groundwater extractions*. Existing replenishment activities are discussed in Section 2.1.2 (surface water percolation) and Section 2.1.3 (groundwater recharge). Managed Aquifer Recharge (MAR) is discussed in Section 8 as a project for GSP implementation.

f) *Activities implementing, opportunities for, and removing impediments to, conjunctive use or underground storage.* Conjunctive use (involving coordinated use of surface water supplies, groundwater supplies, and groundwater storage, and including recharge activities) is described throughout Section 2.1. Conjunctive use projects are discussed is discussed in Section 8 for GSP implementation.

g) *Well construction policies.* Well permitting by both SBCWD and Valley Water is discussed in Section 2.1.5.5.

h) *Groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects.* Local agencies in the Plan Area cooperate with the appropriate regulators on contaminated sites; more information is provided in Section 4.6.1. Groundwater recharge, in lieu, and other managed aquifer recharge programs are described in Sections 2.1.2 and 2.1.3 and discussed throughout this GSP. Water recycling is discussed in Sections 2.1.2 and 2.1.3. Water conveyance is discussed in Section 2.1.2.1. Such projects are discussed in Section 8.

i) *Efficient water management practices.* Water demand management is discussed in Section 2.1.4.3 mostly with reference to activities of the Water Resources Association (WRA) as part of Groundwater Management Plans and Urban Water Management Plans.

j) *Relationships with State and federal regulatory agencies.* Such relationships are implicit in many local efforts. These include, for example, the cooperation of local agencies with state and federal agencies on contamination sites, local efforts toward SGMA compliance in cooperation with DWR, RWQCB, and SWRCB, cooperation with USEPA and USACE on the Kern River and wetlands with respect to the federal Clean Water Act, and cooperation with US Fish & Wildlife Service and CDFW (among others) on environmental issues and endangered species.

k) *Land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity.* Land use planning agencies are identified in Section 2.1.1 and general plans are discussed in Section 2.1.5 in terms of relevance to water resources, supply and demands. County and city representatives were invited to participate in GSP preparation through participation in the Technical Advisory Committee (TAC) or workshops.

l) *Impacts on GDEs.* The interconnection of groundwater and surface water is discussed in Groundwater Conditions Section 4.11 including preliminary identification of GDEs (plants and animals). Potential depletion of interconnected surface water is further discussed in terms of undesirable results and sustainability criteria in Section 6.7.

2.1.7. Notice and Communication

As described in this section, groundwater is the major source of supply in the GSP Area and supports a range of beneficial uses: agricultural, municipal, rural, and environmental. To some degree in the GSP area, all land and property owners, residents, businesses, employees, farmers, and visitors are potentially affected by groundwater use. This reflects the agricultural orientation of the GSP area, its Central Coast setting, and its amenities for small-city living and rural residence and recreation. While recognizing the critical importance of imported CVP supply, reliable groundwater is essential.

The two GSAs have encouraged public participation in the ongoing planning and development activities supporting the GSP process. SBCWD organized a Technical Advisory Committee (TAC) to support the GSP process; regularly scheduled TAC meetings have been announced on the SBCWD website and have been open to the public. In addition, public workshops regarding development of the GSP have been conducted to encourage public participation and to provide educational outreach. Meeting notices have been provided to the list of interested parties that is maintained pursuant to Water Code Section 10723.2. Additionally, GSP development information and meeting notices have been posted to the SBCWD website.

Recognizing the importance of communication, multiple and diverse agencies and interested parties have been identified. These are listed in the SBCWD GSA Communication Plan, which is included as **Appendix D.**

The Communication Plan in **Appendix D** also provides an overview of outreach to the public by means of informational materials (e.g., fact sheets), regular and special GSA Board meetings, public Technical Advisory Committee meetings, workshops, and the GSA website. These inform the public about the GSP development and implementation process and encourage active involvement by interested parties.

Table 2-1. Selected San Benito County General Plan Goals, Policies, and Implementation Measures	
Goal	**Policy and Implementation (see footnote)**
LU-1 To maintain San Benito County's rural character and natural beauty while providing areas for needed future growth.	***LU-1.10* Development Site Suitability** The County shall encourage specific development sites to avoid natural and manmade hazards, including, but not limited to, active seismic faults, landslides, slopes greater than 30 percent, and floodplains. Development sites shall also be on soil suitable for building and maintaining well and septic systems (i.e., avoid impervious soils, high percolation or high groundwater areas, and provide setbacks from creeks). *(RDR)*
PFS-3 To ensure reliable supplies of water for unincorporated areas to meet the needs of existing and future agriculture and development, while promoting water conservation and the use of sustainable water supply sources.	**PFS-3.1 Water District Support** The County shall support efforts of the San Benito County Water District to ensure that adequate high-quality water supplies are available to support current residents and businesses and future development projects. *(MPSP/IGC)* **PFS-3.2 Interagency Coordination** The County shall cooperate with public and private water agencies in order to help address existing and future water needs for the county. *(IGC)* **PFS-3.3 Water Rights Protection** The County shall support public and private water agencies in their efforts to protect their water rights and water supply contracts, including working with Federal and State water projects to protect local water rights. *(IGC)* **PFS-3.4 Drought Response** The County shall encourage all public and private water agencies to develop and maintain drought contingency and emergency services plans, emergency inter-ties, mutual aid agreements and related measures to ensure adequate water services during drought or other emergency water shortage. *(MPSP/IGC)* **PFS-3.5 Water Supply Development** The County shall support plans to develop new reliable future sources of supply, including, but not limited to, the expansion of surface water storage and conjunctive use of surface water and groundwater, while promoting water conservation and water recycling/reuse. *(RDR/MPSP/IGC)* **PFS-3.6 Conjunctive Use** The County shall support conjunctive use of groundwater and surface water to improve water supply reliability. *(MPSP/IGC)* **PFS-3.7 Groundwater Management** The County shall support cooperative, regional groundwater management planning by water resource agencies, water users, and other affected parties to ensure a sustainable, adequate, safe, and economically viable groundwater supply for existing and future uses within the county. *(MPSP/IGC)* **PFS-3.8 Integrated Management** The County shall support and participate in the integrated management of surface water and groundwater resources, wastewater, stormwater treatment and use, and the use of reclaimed water. *(MPSP/IGC)* **PFS-3.9 Sufficient Water Supply for New Development** The County shall require new developments to prepare a source water sufficiency study and water supply analysis for use in preparing, where required, a Water Supply Assessment per SB 610 and a Source Water Assessment per Title 22. This shall include studying the effect of new development on the water supply of existing users. The County encourages the development of integrated regional water management plans or similar plans. *(RDR)*
PFS-4 To maintain an adequate level of service in the water systems serving unincorporated areas to meet the needs of existing and future agriculture and development, while improving water system efficiency.	**PFS-4.1 Adequate Water Treatment and Delivery Facilities** The County shall ensure, through the development review process, that adequate water supply, treatment and delivery facilities are sufficient to serve new development and are able to be expanded to meet capacity demands when needed. Such needs shall include capacities necessary to comply with water quality and public safety requirements. *(RDR)* **PFS-4.2 Water Facility Infrastructure Fees** As a condition of approval for discretionary developments, the County shall not issue approval for a final map until verification of adequate water and wastewater service has been provided, which may include verification of payment of fees imposed for water and wastewater infrastructure capacity per the fee payment schedule from the water and wastewater provider. *(RDR)* **PFS-4.3 Minimum Lot Size** The County shall require a minimum lot size for properties that have on-site septic systems to minimize adverse water quality impacts on groundwater. *(RDR)* **PFS-4.4 Single User Well Consolidation** The County shall encourage consolidation of single user wells into public water districts. *(RDR/MPSP)* **PFS-4.5 Water System Rehabilitation** The County shall encourage the rehabilitation of irrigation systems and other water delivery systems to reduce water losses and increase the efficient use and availability of water. *(RDR/MPSP)*

	PFS -4.6 New Community Water Systems The County shall require any new community water system, in the unincorporated area of the county, serving residential, industrial, or commercial development to be owned and operated by a public or private entity that can demonstrate to the County adequate financial, managerial, and operational resources. *(RDR/IGC)* **PFS-4.7 Consistent Fire Protection Standards for New Development** The County, in coordination with public and private water purveyors and fire protection agencies, shall ensure consistent and adequate standards for fire flows and fire protection for new development, with the protection of human life and property as the primary objectives. *(RDR/IGC)* **PFS-4.8 Water Supply Planning** The County shall encourage water purveyors to develop plans for responding to droughts and the effects of global climate change, including contingency plans, the sharing of water resources to improve overall water supply reliability, and the allocation of water supply to priority users. *(MPSP/IGC)*
PFS-5 To ensure wastewater treatment facilities and septic systems are available and adequate to collect, treat, store, and safely dispose of wastewater.	**PFS-5.1 Water and Sewer Expansion** The County shall encourage public wastewater system operators to maintain and expand their systems to meet the development needs of the county. *(MPSP/IGC)* **PFS-5.2 Reclaimed Water** The County shall encourage public wastewater system operations to upgrade existing wastewater treatment systems to produce reclaimed water suitable for unrestricted reuse. *(MPSP/IGC)* **PFS-5.6 Septic System Design** The County shall require individual septic systems to be properly designed, constructed, and maintained to avoid degradation of ground and surface water quality. *(RDR)*
PFS-6 To manage stormwater from existing and future development using methods that reduce potential flooding, maintain natural water quality, enhance percolation for groundwater recharge, and provide opportunities for reuse.	**PFS-6.1 Adequate Stormwater Facilities** The County shall require that stormwater drainage facilities are properly designed, sited, constructed, and maintained to efficiently capture and dispose of runoff and minimize impacts to water quality. *(RDR)* **PFS-6.2 Best Management Practices** The County shall require best management practices in the development, upgrading, and maintenance of stormwater facilities and services to reduce pollutants from entering natural water bodies while allowing stormwater reuse and groundwater recharge. *(RDR)* **PFS-6.3 Natural Drainage Systems** The County shall encourage the use of natural stormwater drainage systems (e.g., swales, streams) to preserve and enhance the environment and facilitate groundwater recharge. *(RDR)* **PFS-6.4 Development Requirements** The County shall require project designs that minimize stormwater drainage concentrations and impervious surfaces, complement groundwater recharge, avoid floodplain areas, and use natural watercourses in ways that maintain natural watershed functions and provide wildlife habitat. *(RDR)* **PFS-6.5 Stormwater Detention Facilities** Where necessary, the County shall require on-site detention/retention facilities and/or velocity reducers to maintain pre-development runoff flows and velocities in natural drainage systems. *(RDR)* **PFS-6.6 Stormwater Detention Basin Design** The County shall require stormwater detention basins be designed to ensure public safety, be visually unobtrusive, provide temporary or permanent wildlife habitat, and where feasible, provide recreation opportunities. *(RDR)* **PFS-6.7 Runoff Water Quality** The County shall require all drainage systems in new development and redevelopment to comply with applicable State and Federal non-point source pollutant discharge requirements. *(RDR)* **PFS-6.8 Reduce Erosion and Sedimentation** The County shall ensure that drainage systems are designed and maintained to minimize soil erosion and sedimentation and maintain natural watershed functions. *(RDR)*
NCR-2 To protect and enhance wildlife communities through a comprehensive approach that conserves, maintains, and restores important habitat areas.	**NCR-2.5 Mitigation for Wetland Disturbance or Removal** The County shall encourage the protection of the habitat value and biological functions of oak woodlands, native grasslands, riparian and aquatic resources, and vernal pools and wetlands. The County shall require that development avoid encroachment and require buffers around these habitats to the extent practicable. The County shall further require mitigation for any development proposals that have the potential to reduce these habitats. Recreational trails and other features established within natural wetlands and aquatic and riparian buffer areas shall be, as long as such areas are not required to meet the Americans with Disabilities Act, located along the outside of the sensitive habitat whenever possible to minimize intrusions and maintain the integrity of the habitat. Exceptions to this action include irrigation pumps, roads and bridges, levees, docks, public boat ramps, and similar uses. In all cases where intrusions into these buffers are made, only the minimum amount of vegetation necessary to construct the feature shall be removed. *(RDR)*
NCR-4 To protect water quantity and quality in natural water bodies and	**NCR-4.1 Mitigation for Wetland Disturbance or Removal** The County shall consider implementing Regional Water Quality Control Board Basin Plan policies to improve areas of low water quality, maintain water quality on all drainage, and protect and enhance habitat for fish and other wildlife on major tributaries to the Pajaro River (San Benito River, Pacheco Creek) and the Silver Creek watershed. *(RDR/MPSP/IGC)*

groundwater basins and avoid overdraft of groundwater resources.	**NCR-4.2 Water Quality Tests** The County shall require new development to prepare water quality tests prior to project approval, demonstrating whether proposed domestic water supply will meet State primary and secondary drinking water standards. (*RDR)* **NCR-4.3 Agricultural Water** The County shall require well tests for nonagricultural development to provide evidence that 100 percent of the water needs may be met without connecting to the San Felipe Water system. *(RDR)* **NCR-4.4 Open Space Conservation** The County shall encourage conservation and, where feasible, creation or restoration of open space areas that serve to protect water quality such as riparian corridors, buffer zones, wetlands, undeveloped open space areas, and drainage canals. *(RDR/MPSP)* **NCR-4.5 Groundwater Recharge** The County shall encourage new development to preserve, where feasible, areas that provide important groundwater recharge and stormwater management benefits such as undeveloped open spaces, natural habitat, riparian corridors, wetlands, and natural drainage areas. *(RDR)* **NCR-4.6 Groundwater Studies for New Development** To ensure an adequate water supply, large-scale development projects that meet the criteria in California Water Code section 10912 shall prepare an analysis of the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project in accordance with SB 610. *(RDR)* **NCR-4.7 Best Management Practices** The County shall encourage new development to avoid significant water quality impacts and protect the quality of water resources and natural drainage systems through site design, source controls, runoff reduction measures, and best management practices (BMPs). *(RDR)* **NCR-4.8 Water Education** The County shall encourage water districts to provide public education to encourage existing homeowners to adopt water conservation practices for landscaping and interior plumbing. *(IGC/PI)* **NCR-4.9 Water Conservation Plan** The County shall maintain and implement the San Benito County Water Conservation Plan as necessary to promote water conservation and efficient use. *(MPSP)* **NCR-4.10 Water Efficient Landscape Ordinance** The County shall develop, maintain, and implement a Water Efficient Landscape Ordinance, consistent with the Model Water Efficient Landscape Ordinance prepared by the California Department of Water Resources, to require greater use of regionally native drought-tolerant vegetation, limitations on the amount of turf in residential development, and other measures as appropriate. *(RDR)* **NCR-4.11 Reclaimed Water** The County shall require, where feasible, the use of reclaimed water irrigation systems in new development wherever possible. *(RDR)* **NCR-4.12 Rainwater Catchment** The County shall encourage homeowners to install roof catchment systems and use rainwater for non-potable uses in order to reduce the need for groundwater. *(RDR)* **NCR-4.13 Shared Water Systems** The County shall develop, maintain, and implement an ordinance to allow for shared water systems to facilitate the clustering of homes and preservation of agricultural land, where an entity is established to provide maintenance or financing for the maintenance of the water system. *(RDR)* **NCR-4.14 Wastewater Treatment** The County shall require wastewater treatment systems to be designed to promote the long-term protection of groundwater resources in San Benito County. Domestic wastewater treatment systems shall be required to use tertiary wastewater treatment as defined by Title 22. *(RDR/MPSP)* **NCR-4.15 Septic Systems** The County shall require septic systems to be limited to areas where sewer services are not available and where it can be demonstrated that septic systems will not contaminate groundwater. *(RDR)* **NCR-4.16 Develop in Existing Areas** The County shall encourage development to occur in or near existing developed areas in order to reduce the use of individual septic systems in favor of domestic wastewater treatment in an effort to protect groundwater quality. *(RDR)*

* Implementation Categories: RDR - Regulation and Development Review
MPSP - Infrastructure and Service Master Plans, Strategies, and Programs
IGC - Inter-Governmental Coordination

Table 2-2. Selected Santa Clara County General Plan Strategies, Policies and Implementation	
Strategy	**Policy and Implementation**
Water Supply Resources	
Conserve and Reclaim Water	**C-RC 5** An adequate, high quality water supply for Santa Clara County should be considered essential to the needs of households, business and industry. **C-RC 6** A comprehensive strategy for meeting long term projected demand for water should at a minimum include the following: • Continued conservation and increased reclamation; • Securing additional sources as supplemental supply; • System and local storage capacity improvements; and • Drought contingency planning and groundwater basin management programs. **C-RC 7** Countywide land use and growth management planning should be coordinated with overall water supply planning by the SCVWD in order to maximize dependability of long term water supply resources. **C-RC 8** Environmental impacts of all state and local water supply planning and decision-making should be taken into full consideration. **C-RC 9** Conservation should continue to be considered an integral component of local water "supply" resources, effectively minimizing the amount of supplemental supplies which must be obtained from other sources. **C-RC 10** Educational measures should be continued/increased in order inform the public of the need for conservation over the long term, rather than as a temporary response to periodic drought. **C-RC 11** Domestic conservation should be encouraged throughout Santa Clara County by a variety of means, including reduced flow devices, drought-resistant landscaping, and elimination of wasteful practices. **C-RC 12** More efficient use of water for agricultural irrigation and industrial processes should be promoted through improved technology and practices. **C-RC 13** Use of reclaimed wastewater for landscaping and other uses, including groundwater recharge if adequately treated, should be encouraged and developed to the maximum extent possible.
Obtain Additional Sources of Imported Water	**C-RC 14** Reforms of the state-wide system of water allocation and distribution should be encouraged which facilitate the ability of urban area water suppliers to purchase needed supplies through market mechanisms.
Make System and Local Storage Capacity Improvements	**C-RC 15** Potential for new and/or expanded local reservoirs should be thoroughly examined as a part of any long term strategy for assuring adequate water supply, taking into full account environmental and financial feasibility. **C-RC 16** Seismic safety considerations for new and existing reservoirs should be addressed in order to ensure water supply and public safety in the event of earthquake.
Maintain Drought Contingency and Groundwater Basin Management Plans	**C-RC 17** Drought contingency plans and groundwater basin management programs should be reviewed and updated to prepare for the likelihood of future periods of short-term drought and to minimize: • the potential adverse impacts of drought upon households, business, and industry, and • the possibility of groundwater overdraft and land subsidence.
Water Quality and Watershed Management	
Reduce Non-Point Source Pollution	**C-RC 18** Water quality countywide should be maintained and improved where necessary to ensure the safety of water supply resources for the population and the preservation of important water environments and habitat areas. **C-RC 19** The strategies for maintaining and improving water quality on a countywide basis, in addition to ongoing point source regulation, should include: • effective non-point source pollution control; • restoration of wetlands, riparian areas, and other habitats which serve to improve Bay water quality; and • comprehensive Watershed Management Plans and "best management practices" (BMPs). **C-RC 20** Adequate safeguards for water resources and habitats should be developed and enforced to avoid or minimize water pollution of various kinds, including: • erosion and sedimentation; • organic matter and wastes; • pesticides and herbicides; • effluent from inadequately functioning septic systems; • effluent from municipal wastewater treatment plants; • chemicals used in industrial and commercial activities and processes; • industrial wastewater discharges; • hazardous wastes; and • non-point source pollution.

	C-RC 21 Multi-jurisdictional, countywide programs and regulatory efforts to address water pollution problems should have the full support and participation of each jurisdiction within Santa Clara County, including cities, special districts, state and federal agencies, and County government.
Protect the Biological Integrity of Critical Habitat Areas	**C-RC 31** Areas of habitat richest in biodiversity and necessary for preserving threatened or endangered species should be formally designated to receive greatest priority for preservation, including baylands and riparian areas, serpentine areas, and other habitat types of major significance. **Implementation Recommendations** ***C-RC(i)15*** Explore opportunities for restoration of habitat, particularly with respect to wetland, riparian, and other habitat types rich in diversity or needed to protect threatened and endangered species. {Implementors: Cities, County, RWQCB, state agencies}
Encourage Habitat Restoration	**C-RC 34** Restoration of habitats should be encouraged and utilized where feasible, especially in cases where habitat preservation and flood control, water quality, or other objectives can be successfully combined.
Safety and Noise: Waste Water Disposal	
Prevent Waste Water Contamination of Groundwater Supplies	**C-HS 42** The long-term viability and safety of underground aquifers and groundwater systems countywide shall be protected to highest degree feasible. **C-HS 43** Urban land uses should be in cities and served by centralized wastewater treatment systems. **C-HS 44** All new on-site wastewater treatment systems should be located only in areas where: • there is reasonable assurance that they will function well over a long period; • they can be designed to have a minimum negative impact on the environment; and • they will not contaminate wells, groundwater or surface water. **C-HS 45** On-site wastewater treatment systems should not be allowed in areas where soil characteristics impede their operation (e.g., areas of high groundwater conditions, areas with saturated soils, areas with limited depth to bedrock, etc.). **C-HS 46** Hazardous materials, whether commercial, industrial, agricultural, or residential in character, should not be disposed of in any wastewater or on-site wastewater treatment system. **Implementation Recommendations** **C-HS(i) 42** Develop and implement standards for land subdivision and development which must rely on using on-site wastewater treatment systems so as to minimize negative environmental impacts and maximize the useful life of such systems. (Implementors: County and cities.) **C-HS(i) 43** Prevent overdevelopment requiring on-site wastewater treatment systems in areas where groundwater quality has been so impacted as to pose a discernible threat to the long term integrity and safety of underground water supplies. (Implementors: County and cities.)
Monitor Groundwater Quality	**C-HS 47** Groundwater quality should be monitored to ensure the long-term integrity of countywide water resources. **Implementation Recommendations** **C-HS(i) 44** Monitor the groundwater quality throughout the county to insure the long-term integrity of the aquifers and the safety of water supplies to all users. (Implementors: County and Cities.) **C-HS(i) 45** Maintain low cost laboratory access for well water testing. (Implementors: County and Cities.)
South County Joint Area Plan Policies	
Water Supply	***SC 7.0*** New development should not exceed the water supply, and management of water should be made more efficient through appropriate means, such as watershed protection, percolation, reclamation, and conservation. ***SC 7.1*** Programs to identify and seal abandoned and unused wells should be continued, as such wells may be prime sources for transferring contaminants from the upper to lower aquifer. ***SC 7.2*** The South County jurisdictions should develop a program to track existing water quality, water supply and water flow monitoring programs. This information should be used to evaluate current regulations and procedures, and to assess the need for new monitoring programs or for revisions or consolidation of existing programs. ***SC 7.3*** Each jurisdiction and agency pumping water from wells should be responsible for knowing the demand that its well pumping imposes on the direction of flow of water and how it affects others that are pumping from the same aquifer, and to prevent any adverse impacts on existing groundwater contamination problems. ***SC 7.4*** All jurisdictions and agencies pumping water from wells should cooperate in managing the aquifer so as to preserve the natural ecology of the region, securing the aquifer's utility as a water resource and ensuring the water's quality. ***SC 7.5*** Streambeds and other appropriate percolation areas should be protected. ***SC 7.6*** There should be continuing coordination among the South County jurisdictions and the Santa Clara Valley Water District to assure that the South County will get sufficient deliveries of San Felipe water as needs require. ***SC 7.7*** The water district should continue developing programs to assure effective management of the water resources, such as well monitoring, percolation of imported water, reclamation and conservation. ***SC 7.8*** New development should not exceed the water supply, and use of water should be made more efficient through appropriate means, such as conservation and reclamation. ***SC 7.9*** The development of water reclamation facilities should be encouraged, where feasible, in order to make reclaimed water available to help meet the growing needs of the South County region.

Water Quality	***SC 8.0*** Water quality should be protected from contamination, and should be monitored to assure that present policies and regulations are adequate. Such uses as waste facilities, septic systems and industries using toxic chemicals should be prohibited where polluting substances may come in contact with groundwater, floodwaters, and creeks or reservoir waters. ***SC 8.1*** Land use policies should be continued that limit the number of individual septic systems in areas vulnerable to groundwater contamination, because of the potential for cumulative degradation of water quality. ***SC 8.2*** In areas where future development is expected to be served by sewers, large lot policies (which allow minimal development and limited numbers of septic systems) should be continued. This approach increases the feasibility of designing future urban density subdivisions with smaller lots, which are more efficient for sewers in terms of service and cost. ***SC 8.3*** In the unincorporated area current County policies regarding septic systems and land use should be continued with no lessening of standards. ***SC 8.4*** Groundwater and surface water quality conditions throughout the South County should be monitored to determine if changes in regulations regarding septic systems and land use are needed. Protection of groundwater quality requires continued caution in the siting of landfills and transfer stations and rigorous enforcement of local and regional regulations. ***SC 8.6*** Continued caution should be taken as to the siting of landfills, the construction of landfills (i.e., they should have clay liners, etc.), and the waste allowed in a sanitary landfill in South County so as not to create hazards to groundwater quality. ***SC 8.7*** Solid waste and hazardous waste transfer stations should be sited and operated so as to minimize hazards to ground and surface water quality. ***SC 8.8*** Regulations relating to solid waste disposal should continue to be rigorously enforced by the local jurisdictions and by the Regional Water Quality Control Boards. ***SC 8.11*** Properties located in areas that have soils with rapid water percolation shall be protected from future development in order to ensure existing water quality. Such development should not begin until preceded by the inclusion within the Cities' and County's Hazardous Materials Storage Ordinance a section specifically related to high percolation rates. ***SC 8.12*** Commercial and industrial developments proposed to be located in areas that have soils with rapid water percolation should be permitted only under the strict safety limitations as may be required by the Cities' and/or County's Hazardous Materials Specialists. ***SC 8.13*** In order to provide greater protection of the aquifers which supply drinking water to the South County, special consideration should be given to the management of contaminants (e.g., hazardous materials, sanitary effluents) in groundwater recharge areas where no protective aquitard layer exists. ***SC 8.14*** Each agency and jurisdiction responsible for well monitoring should continue to monitor wells and provide results to a central agency (yet known) which would coordinate the data and make it available to all jurisdictions and agencies. ***SC 8.15*** Programs for monitoring private wells should continue to expand the scope of testing by including tests of more wells and including tests on constituents not yet tested in private wells (i.e., volatile organics, bacteriological, radiological, etc.), and periodic retesting of selected private wells
Development Hazards/Environmental Safety	***SC 15.8*** Natural streamside and riparian areas should be left in their natural state, in order to preserve their value as percolation and recharge areas, natural habitat, scenic resources, recreation corridors and for bank stabilization. If flood control projects needed to protect presently existing development make this infeasible, disruption should be minimized, maintaining slow flow and stable banks through design and other appropriate mitigation measures.

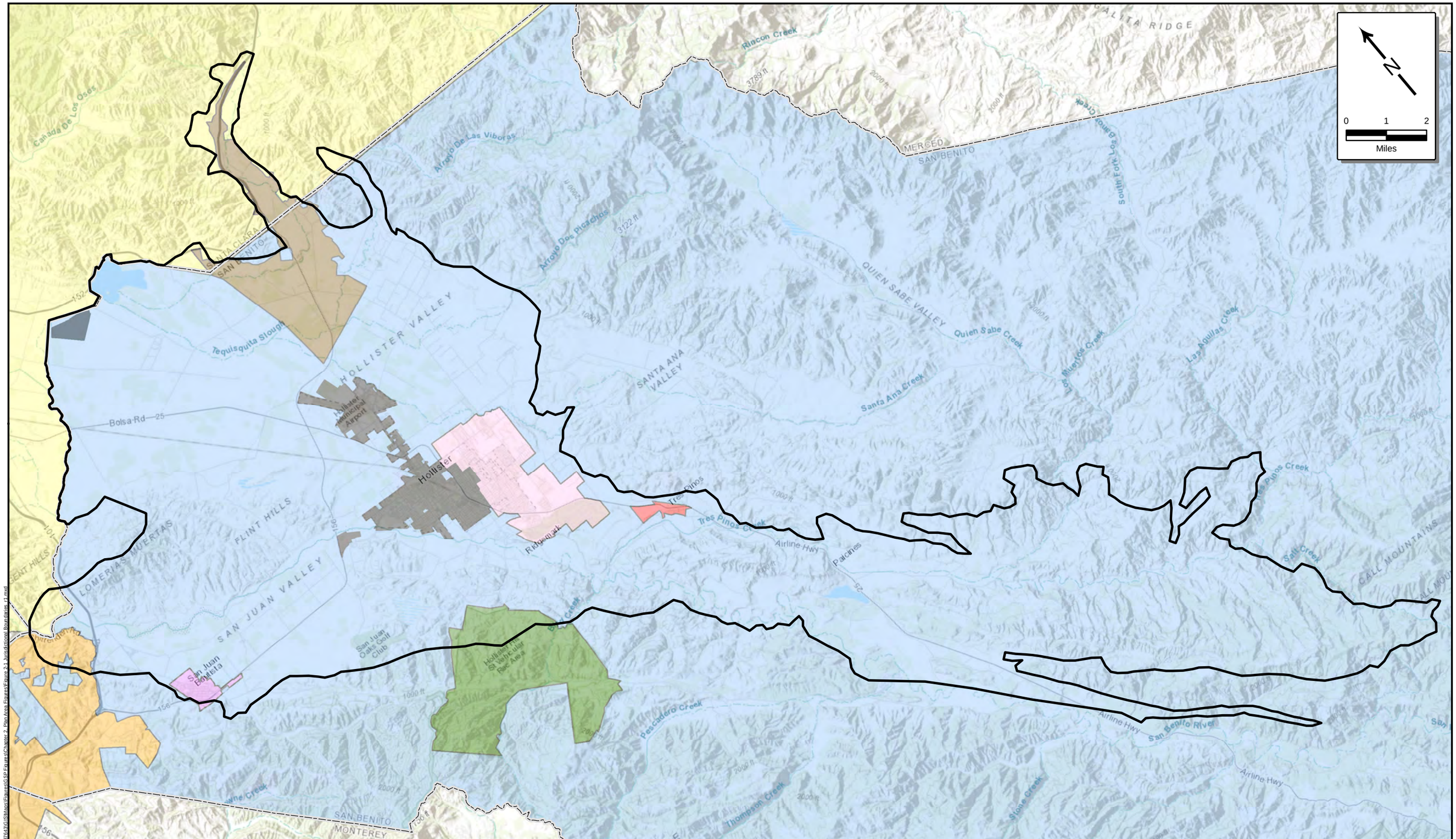
Table 2-3. Selected City of Hollister General Plan Goals, Policies, and Implementation Measures		
Goal	**Policy**	**Implementation Measures**
Housing Element		
H1 Work together to build a sense of community and achieve housing goals	**H1.4 Timing of Housing and Infrastructure** Continue to support the timing of new housing with needed infrastructure improvements.	Expand sewer and water system capacity to meet housing needs [H.B]
Community Services and Facilities Element		
CSF1 Coordinate with other agencies and plan for the provision of adequate infrastructure, facilities and services	**CSF1.1 Adequate Capabilities and Capacity of Local Public Services** Ensure that future growth does not exceed the capabilities and capacity of local public services such as wastewater collection and treatment, local water supply systems, fire and police protection, maintenance of streets and roads, local school systems, parks and recreational facilities, and landfill capacity, and ensure that public services meet Federal and State standards and are available in a timely fashion. **CSF1.6 Other Infrastructure Planning** Require the preparation of infrastructure master plans in areas outside the designated Sphere of Influence as a prerequisite to annexation. Such plans shall contain, but not be limited to, plans for sewer services, water service, storm drainage, traffic circulation, recreation facilities, school facilities and funding alternatives for police and fire services. **CSF1.7 Development Review Criteria for Public Services** Prior to granting approval, evaluate each new development in terms of the following criteria: 1. Would the proposed development share a common border with a property that has already been developed? 2. Would the proposed development be adequately served by infrastructure (water, sewer, streets, schools, parks, etc.), which is already in place or mitigated? 3. Would the proposed development be located within the existing service areas of local service providers (fire protection, police protection, solid waste disposal, schools, etc.), and not result in a reduction in their current capabilities?	Maintain an up-to-date CIP [CSF.CC] Adopt a performance standards ordinance [CSF.D] Coordinate with the San Benito County Water District, San Benito County and the Sunnyslope County Water District in water and wastewater system expansion needs [CSF.F]
CSF 2 Plan for adequate sewer and water facilities	**CSF2.1 Sewer and Water Facilities** Coordinate with responsible districts and agencies to assure that sewer and water facility expansion and/or improvements meet Federal and State standards and occur in a timely manner. **CSF2.4 Local Water Supply System** Encourage development in those portions of the Hollister Planning Area which are already served by the local water supply systems or to which water supply systems can reasonably be extended. **CSF2.6 Provision of Water Service to New Development** Require developers who will require water service for their project to apply to the City of Hollister, the Sunnyslope County Water District and the San Benito County Water District, in that order, for service. Only if the proposed	Maintain data on sewer and water system capacity [CSF.DD] Monitor water quality at the wastewater treatment plant [CSF.EE] Establish requirements for water conservation in new development [CSF.I] Provide information on water conserving landscaping [CSF.M] Identify opportunities for water recycling [CSF.Q] Update the City's Water System Master Plan [CSF.R] Coordinate with the water resources association of San Benito County [CSF.V] Implement plans for a regional wastewater treatment facility [CSF.Z]

	development is denied service by all three agencies can it then be allowed to use groundwater as a source of water. **CSF2.7 Water Conservation Measures** Encourage water-conserving practices and features in the design of structures and landscaping, and in the operation of businesses, homes and institutions, and increase the use of recycled water.	
CSF3 Provide adequate drainage facilities, limit erosion and maintain clean water	**CSF3.3 Local, State and Federal Standards for Water Quality** Continue to comply with local, State and Federal standards for water quality. **CSF3.4 Water Quality Tests and Mitigation** As part of the development review process, require developers to conduct well and ditch tailwater tests to determine the presence of "Category I" herbicides and pesticides, and triazide herbicides, as well as other chemicals that have the potential to pollute the groundwater and cause health risks. Based on findings, and at the project applicant's expense, implement appropriate requirements to protect public health. **CSF3.5 Infiltration Areas** Require new development to identify sites which may be used for vegetated swales or strips, infiltration, media infiltration, water-oil separators, wet ponds, constructed wetlands, extended detention basins and multiple systems which may enhance water quality. **CSF3.6 Education and Outreach on Water Quality Programs** Support public education regarding water pollution prevention and mitigation programs. **CSF3.7 Pollution from Urban Runoff** Address non-point source pollution and protect receiving waters from pollutants discharged to the storm drain system by requiring Best Management Practices. This would include: 1. Support alternatives to impervious surfaces in new development, redevelopment, or public improvement projects to reduce urban runoff into storm drain system and creeks; 2. Require that site designs work with the natural topography and drainages to the extent practicable to reduce the amount of grading necessary and limit disturbance to natural water bodies and natural drainage systems; and, 3. Where feasible, use vegetation to absorb and filter fertilizers, pesticides and other pollutants.	Establish procedures and requirements for well and ditch tail water tests [CSF.H] Implement actions for pesticide and fertilizer management [CSF.L] Adopt a Storm Water Master Plan [CSF.O] Identify drainage system improvements [CSF.P] Prepare guidelines for water quality source control program [CSF.S] Conduct water quality education programs [CSF.T] Continue to require proper disposal of pollutants [CSF.U]
CSF4 Provide for an adequate level of community services and facilities to ensure the continued health, education, welfare and safety of all residents and businesses	**CSF4.3 Coordination with Utility Providers** Promote the availability and adequate delivery of reliable, modern, and competitively priced utilities necessary for businesses to prosper, such as power, water and telecommunications.	Require utility providers review [CSF.MM]
Natural Resources and Conservation Element		
NRC1 Assure enhanced habitat for native plants and animals, and special protection for threatened or endangered species	**NRC 1.1 Protection of Environmental Resources** Protect or enhance environmental resources, such as wetlands, creeks and drainageways, and habitat for threatened and endangered species. **NRC 1.5 Wetlands Preservation** Maintain existing riparian areas in their natural state to provide for wildlife habitat, groundwater percolation, water quality, aesthetic relief and	Require project mitigation for habitat [NRC.V] Require wetlands delineation [NRC.X] Require wetlands replacement plans [NRC.Y]

	recreational uses that are environmentally compatible with wetland preservation. Require appropriate public and private wetlands preservation, restoration and/or rehabilitation through compensatory mitigation in the development process for unavoidable impacts. Support and promote acquisition from willing property owners, and require those development projects, which may result in the disturbance of delineated seasonal wetlands to be redesigned to avoid such disturbance. **NRC 1.6 Enhancement of Creeks and Drainageways** Explore enhancement of, and support continuous upgrades to, drainageways to serve as wildlife habitat corridors for wildlife movement and to serve as flood control facilities to accommodate storm drainage. Require setbacks, creek enhancement and associated riparian habitat restoration/creation for projects adjacent to creeks to maintain storm flows, reduce erosion and maintenance and improve habitat values, where feasible. Generally, all new structures and paved surfaces should be set back 100 feet from wetlands and creeks.	
NRC3 Conserve and manage natural resources	NRC 3.1 Development Practices to Conserve Resources Promote development practices, which will result in the conservation of energy, water, minerals and other natural resources, and promote the use of renewable energy technologies (such as solar and wind) when possible. NRC 3.2 Resource-Efficient Organizations and Businesses Encourage businesses, commercial property owners, apartment building owners and non-profit organizations to be resource, energy and water efficient.	Encourage "green" building standards and processes [NRC.E] Apply Title 24 requirements [NRC.J] Implement the LEED program [NRC.O] Publicize energy conservation programs [NRC.Q]

Table 2-4. Selected City of San Juan Bautista General Plan Goals, Objectives, Policies, and Programs		
Goals and Objectives	**Policy**	**Program**
Land Use		
LU2 A town with a balanced and diversified set of land uses **LU 2.7** Prohibit land uses for, or in support of, oil and gas exploration and development in order to: • Preserve agricultural land and viewsheds; • Protect groundwater supplies, air and water quality, and wildlife habitat; • Expand tourism; • Encourage desired industries; and • Avoid incompatible land uses.	**LU 2.7.1** Prohibit development, construction, installation, or use of any facility or above ground equipment for, or in support of, oil or gas exploration or development on all lands within the City's boundaries.	**LU 2.7.1.1** Adopt a zoning ordinance to conform the zoning code to Policy LU 2.7.1 and adopt Hillside Development regulations. **LU 2.7.1.2** Encourage the County of San Benito to regulate land use within the City's Sphere of Influence and Planning Area (or Area of Concern) Boundary consistent with Policy LU 2.7.1.
Conservation		
CO 2 Clean air and water for residents and visitors **CO 2.1** Protect the quality of surface and groundwater resources.	**CO 2.1.1** Improve groundwater quality by maintaining high potable water quality standards.	**CO 2.1.1.1** Finish and implement plans for a 'pellet plant' that will treat water in central location before it is delivered to customers.
CO 3 Efficient use of energy and natural resources **CO 3.2** Practice sustainable water resource management.	**CO 3.2.1** Integrate water efficiency into local government operations and policies.	**CO 3.2.1.1** Provide resources for water efficient landscaping and fixtures in new developments. **CO 3.2.1.2** Retrofit municipal landscapes with water-efficient planting. **CO 3.2.1.3** Monitor municipal water use and develop water conservation goals. **CO 3.2.1.4** Retrofit municipal facilities with water efficient fixtures and appliances. **CO 3.2.1.5** Retrofit municipal facilities to utilize reclaimed water in landscaping. **CO 3.2.1.6** Install purple pipe infrastructure at future municipal facilities and parks to facilitate the use of reclaimed water for irrigation. **CO 3.2.1.7** Require new subdivisions and commercial development to utilize sustainability measures for capture and storage of rainwater for such appropriate uses as irrigation of public open space areas, parks, and lawns.
CO 4 Protection of wildlife, habitat, air quality, and water resources **CO 4.1** Protect all state and federally listed special-status species and their critical habitat. **CO 4.4** Meet state mandated per capita water consumption goals established in Senate Bill X7-7.	**CO 4.1.1** Comply with federal and state laws regarding the protection of special-status species and habitat, as defined by US Fish and Wildlife Service. **CO 4.4.1** Inform the public about city-wide water use and water conservation goals.	**CO 4.1.1.1** Provide a list of local native plant species for landscaping in order to prevent the introduction of invasive species. **CO 4.1.1.2** Establish tree protection guidelines. **CO 4.4.1.1** Incorporate information on current water use, water conservation goals, and ways to reduce water use with water bills for residents and businesses. **CO 4.4.1.2** Regularly monitor city-wide water use and include results in local government reporting. **CO 4.4.1.3** Work with the Water Resource Association of San Benito County and the State Water Resources Control Board to promote and expand water conservation programs to local residents and businesses.
Open Space		
OS 4 Preserve prime farmland with viable local agricultural operations **OS 4.1** Avoid or mitigate loss of prime farmland soils and conserve non-prime agricultural uses.	**OS 4.1.1** Promote City-centered and contiguous smart growth.	**Program OS 4.1.1.1** Keep existing water resources for agricultural activities.

Public Facilities and Services		
PF 1 A community with high quality water and sewer services provided in the most efficient, cost effective, and environmentally sound manner **PF 1.1** Improve the quality of water, water treatment facilities, and water services for residents and businesses. **PF 1.2** Manage groundwater resources to maintain a secure water supply for residents and businesses. **PF 1.3** Improve the quality of sewer treatment facilities and services for residents and businesses.	**PF 1.1.1** Maintain land uses around City wells that minimize the risk of groundwater contamination. When private development occurs around a City well, require the provision of a replacement well if the development could potentially have an adverse impact on well water quality. **PF 1.1.2** Improve potable water quality and groundwater quality by treating water to a higher standard before delivery to residents and businesses. **PF 1.2.1** Maintain adequate water capacity for residents and businesses. New development should only be permitted when water services can be provided without threatening the level of service to the rest of the city. **PF 1.2.2** Allow private water wells within the sphere of influence only where the City cannot feasibly provide public water service or where an established water system, such as the one serving San Juan School, has been determined adequate by the City Engineer. In the former case, the use of private wells should be discontinued when City water service becomes available. **PF 1.2.3** Provide extensions of City potable water service only to properties within the designated sphere of influence. Do not extend service or sell capacity to development on agricultural or open space lands outside the City's Urban Growth Boundary. **PF 1.3.1** Allow individual septic systems within the sphere of influence only where the City cannot feasibly provide sewer service and where the County Health Department has determined that sufficient area and soil conditions exist for a septic tank leach field or other accepted method of effluent disposal. In such cases, the use of septic systems should be discontinued when City sewer service becomes available within 600 feet of the property. **PF 1.3.2** Provide extensions of City sewer service only to properties within the designated sphere of influence. Do not extend service to development on agricultural or open space lands outside the City's sphere of influence.	**PF 1.1.2.1** Finish and implement plans for a 'pellet plant' that will treat water in a central location before it is delivered to customers. **PF 1.1.2.2** Promote and incentivize the removal of home water softeners once water quality goals are met to reduce the salinity of wastewater. **PF 1.1.2.3** Produce an annual report to the City Council on water quality. Use this information to determine whether the City is meeting state water quality standards. **PF 1.2.3.1** Produce an annual report to the City Council on water capacity and actual use. Use this information to determine where and when capital improvements are needed. **1.3.2.1** Produce an annual report to the City Council on sewer capacity and actual use. Use this information to determine where and when capital improvements are needed. **PF 1.3.2.2** As part of the City's Capital Improvements Program, reduce infiltration and inflow problems at the City's wastewater treatment plant by improving the trunk line leading from the collection system into the wastewater plant. Undertake other capital improvements as determined necessary by the plant operator and City Engineer. **PF 1.3.2.3** Develop a plan for the long-term expansion or relocation of the City's wastewater treatment plant or begin planning a second facility.
Health		
HE 6 Environmental quality to increase public health HE 6.2 Enhance air and water quality.	HE 6.2.1 Create design standards in the planning review process to enhance water quality. HE 6.2.2 Continue to work with residents, businesses, and the relevant environmental protection agencies to create a plan for improving water quality.	HE 6.2.1.1 Protect the quality of water sources, including cones of influence, water recharge areas, and water wells from future degradation through design standards. HE 6.2.1.2 Ensure that design standards for all stormwater retention and detention systems are adhered to in order to prevent the degradation of surface water bodies. HE 6.2.1.3 Require that impervious surfaces be limited and mitigated with low impact development in prime recharge areas. HE 6.2.2.1 Protect potable water well fields from man-made and natural sources of pollution. HE 6.2.2.2 Plan for emergency conservation and use of recycled water sources. HE 6.2.2.3 Create a San Juan Creek restoration program.



San Benito County Water District	City of San Juan Bautista	Sunnyslope County Water District	Wildlife Heritage Foundation Pajaro River Mitigation Bank
Santa Clara Valley Water District	Aromas Water District	Tres Pinos County Water District	North San Benito Basin
City of Hollister	Pacheco Pass Water District	CA Parks And Recreation, Hollister Hills	

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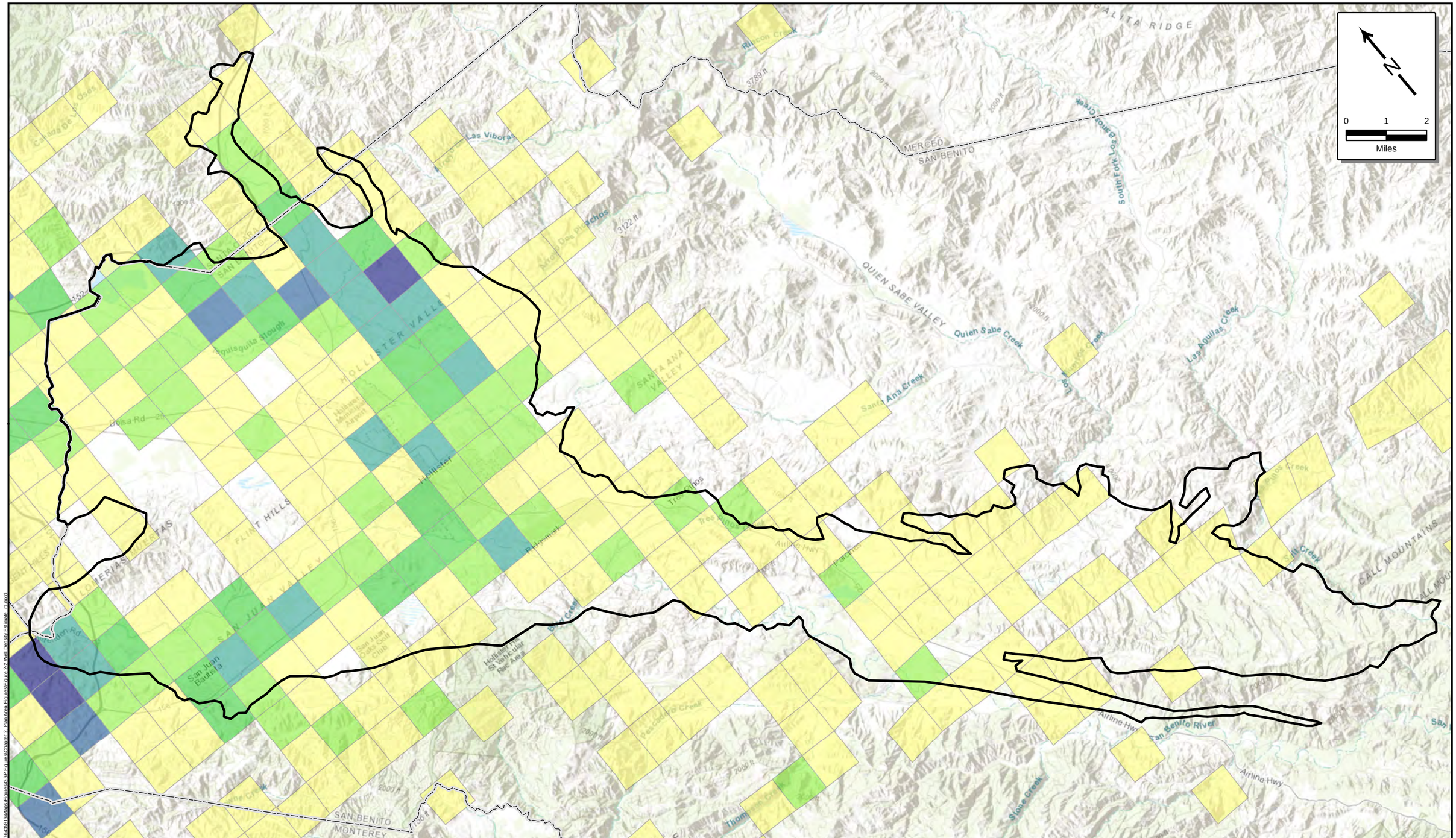
TODD GROUNDWATER

Figure 2-1
Jurisdictional Boundaries



Estimated Well Density by PLSS Section* - All Wells

- 1 to 5 Wells Total
- 5 to 10 Wells Total
- 10 to 15 Wells Total
- 15 to 20 Wells Total
- 20 to 25 Wells Total
- 25 to 30 Wells Total

North San Benito Basin

* The Public Land Survey System (PLSS) is a way of subdividing and describing land in the United States. PLSS Sections are one-mile square rectangular grids of 640 miles each. All lands in the public domain are subject to subdivision by this rectangular system of surveys, which is regulated by the U.S. Department of the Interior, Bureau of Land Management (BLM).

November 2021

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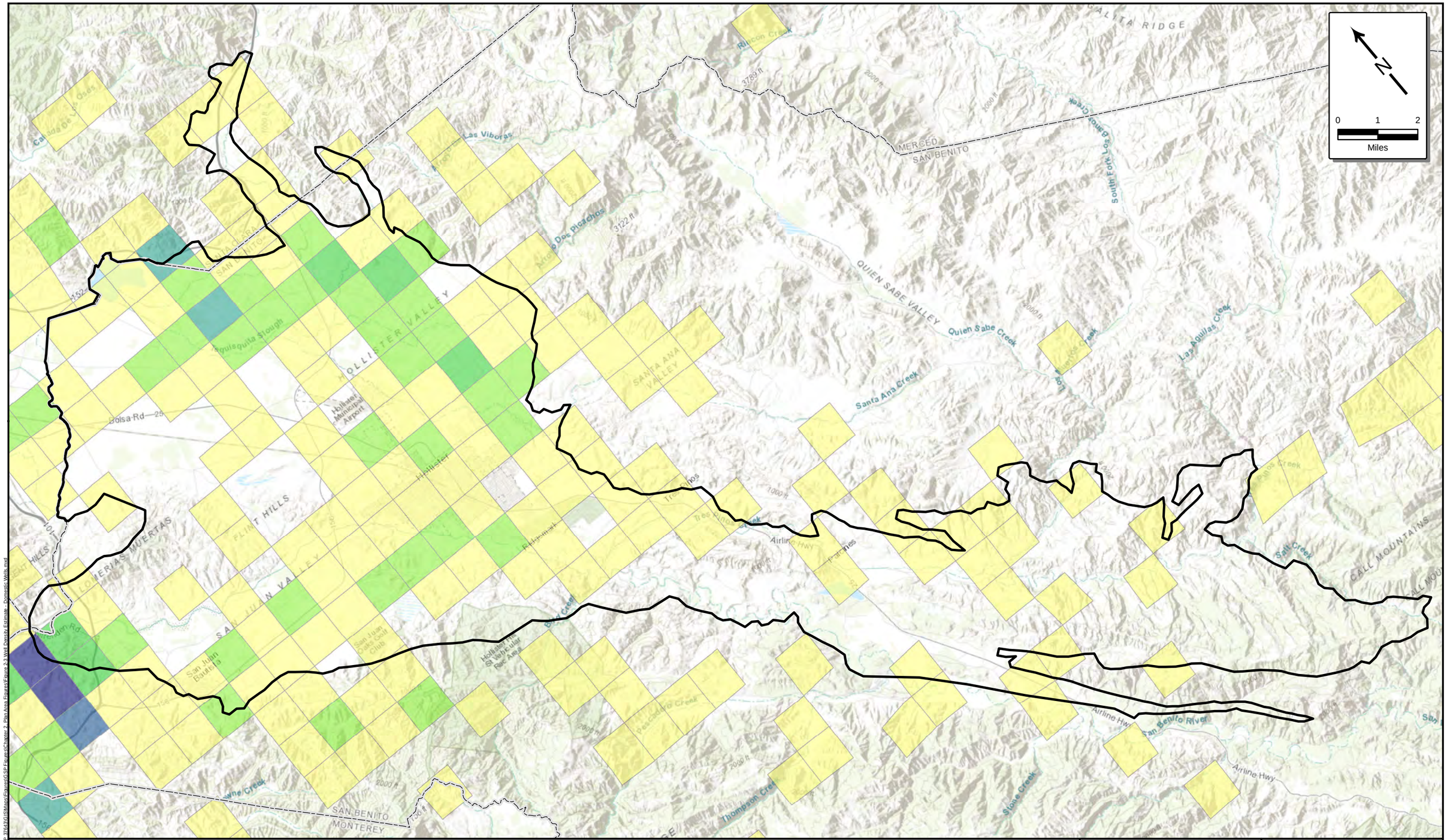
Figure 2-2
Estimated Density of All Wells



Estimated Well Density by PLSS Section* - Domestic Wells

- 1 to 5 Domestic Wells
- 5 to 10 Domestic Wells
- 10 to 15 Domestic Wells
- 15 to 20 Domestic Wells
- 20 to 25 Domestic Wells
- 25 to 30 Domestic Wells
- North San Benito Basin

* The Public Land Survey System (PLSS) is a way of subdividing and describing land in the United States. PLSS Sections are one-mile square rectangular grids of 640 miles each. All lands in the public domain are subject to subdivision by this rectangular system of surveys, which is regulated by the U.S. Department of the Interior, Bureau of Land Management (BLM).

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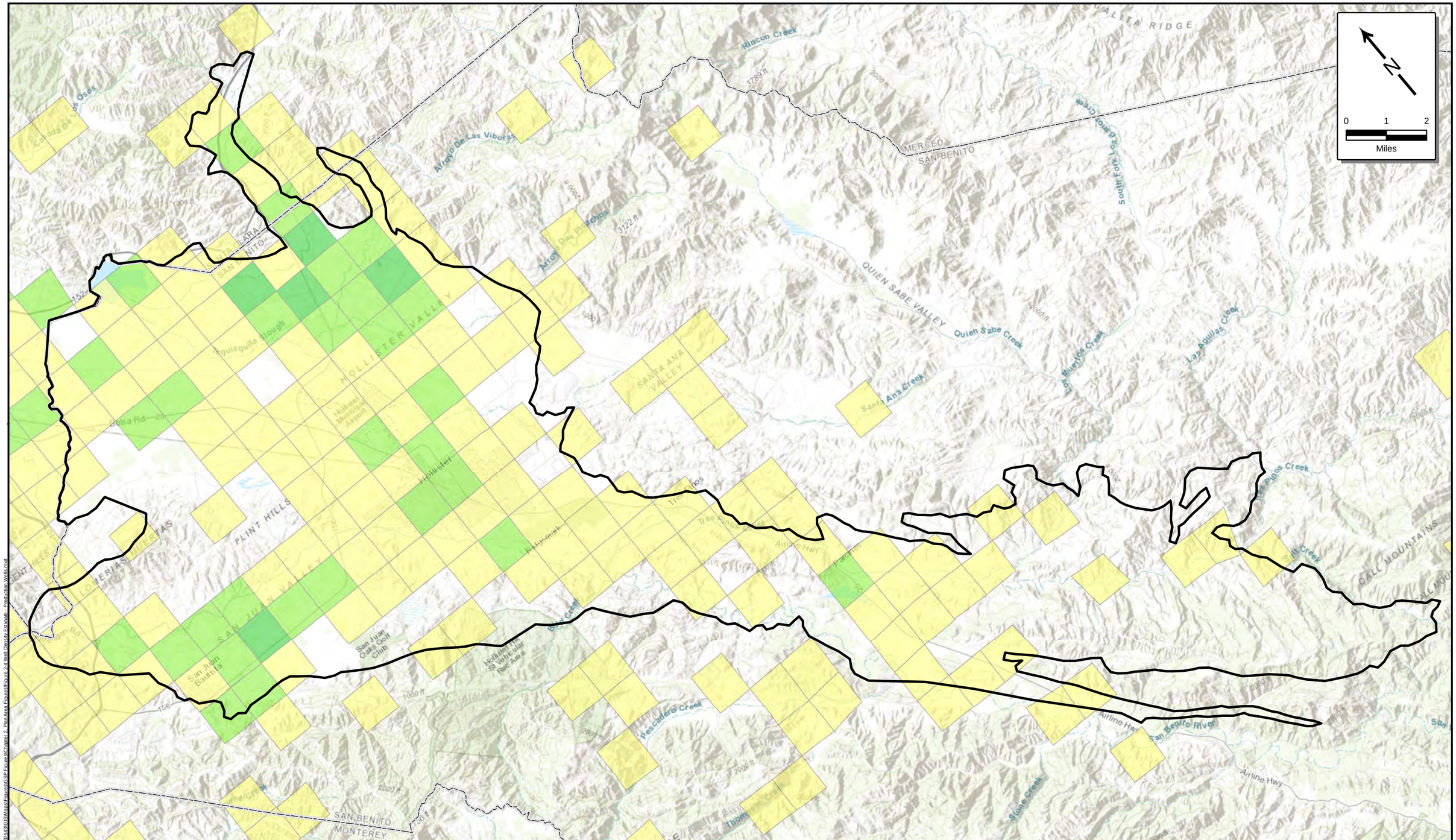
Figure 2-3
Estimated Density of Domestic Wells

Path: Y:\Projects\San Benito GSA_27643\GIS\Maps\Figures\Chapter 2_Plan Area\Figures\Figure 2-3 Well Density Estimate - Domestic Wells.mxd



Estimated Well Density by PLSS Section* - Production Wells

- 1 to 5 Production Wells
- 5 to 10 Production Wells
- 10 to 15 Production Wells
- 15 to 20 Production Wells
- 20 to 25 Production Wells
- 25 to 30 Production Wells
- North San Benito Basin

* The Public Land Survey System (PLSS) is a way of subdividing and describing land in the United States. PLSS Sections are one-mile square rectangular grids of 640 miles each. All lands in the public domain are subject to subdivision by this rectangular system of surveys, which is regulated by the U.S. Department of the Interior, Bureau of Land Management (BLM).

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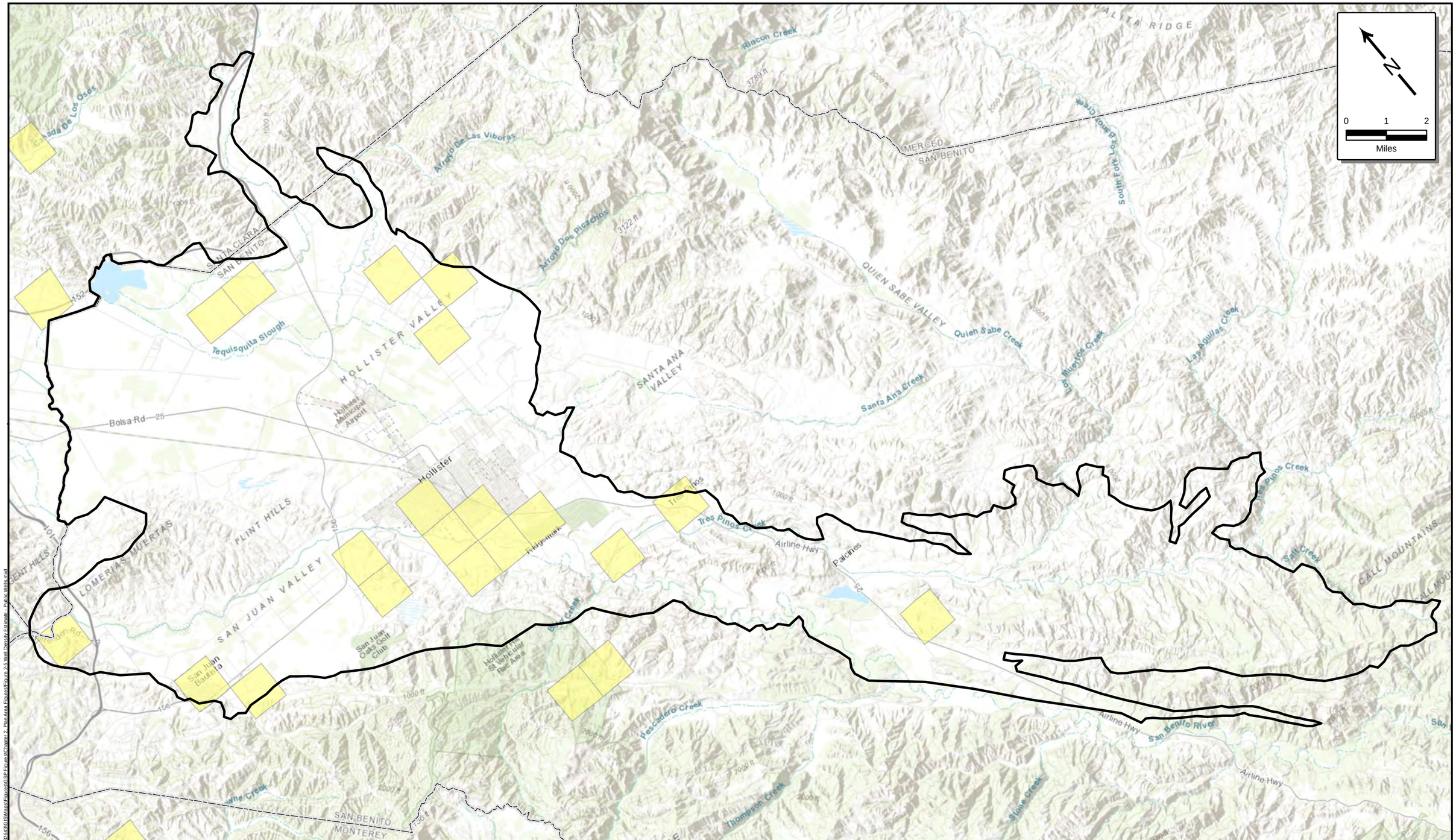
Figure 2-4
Estimated Density of Production Wells

Path: P:\Projects\San Benito GSP_0764\GIS\Maps\Figures\GSP Figures\Chapter 2 Plan Area Figures\Figure 2-4 Well Density Estimate - Production Wells.mxd



* The Public Land Survey System (PLSS) is a way of subdividing and describing land in the United States. PLSS Sections are one-mile square rectangular grids of 640 miles each. All lands in the public domain are subject to subdivision by this rectangular system of surveys, which is regulated by the U.S. Department of the Interior, Bureau of Land Management (BLM).

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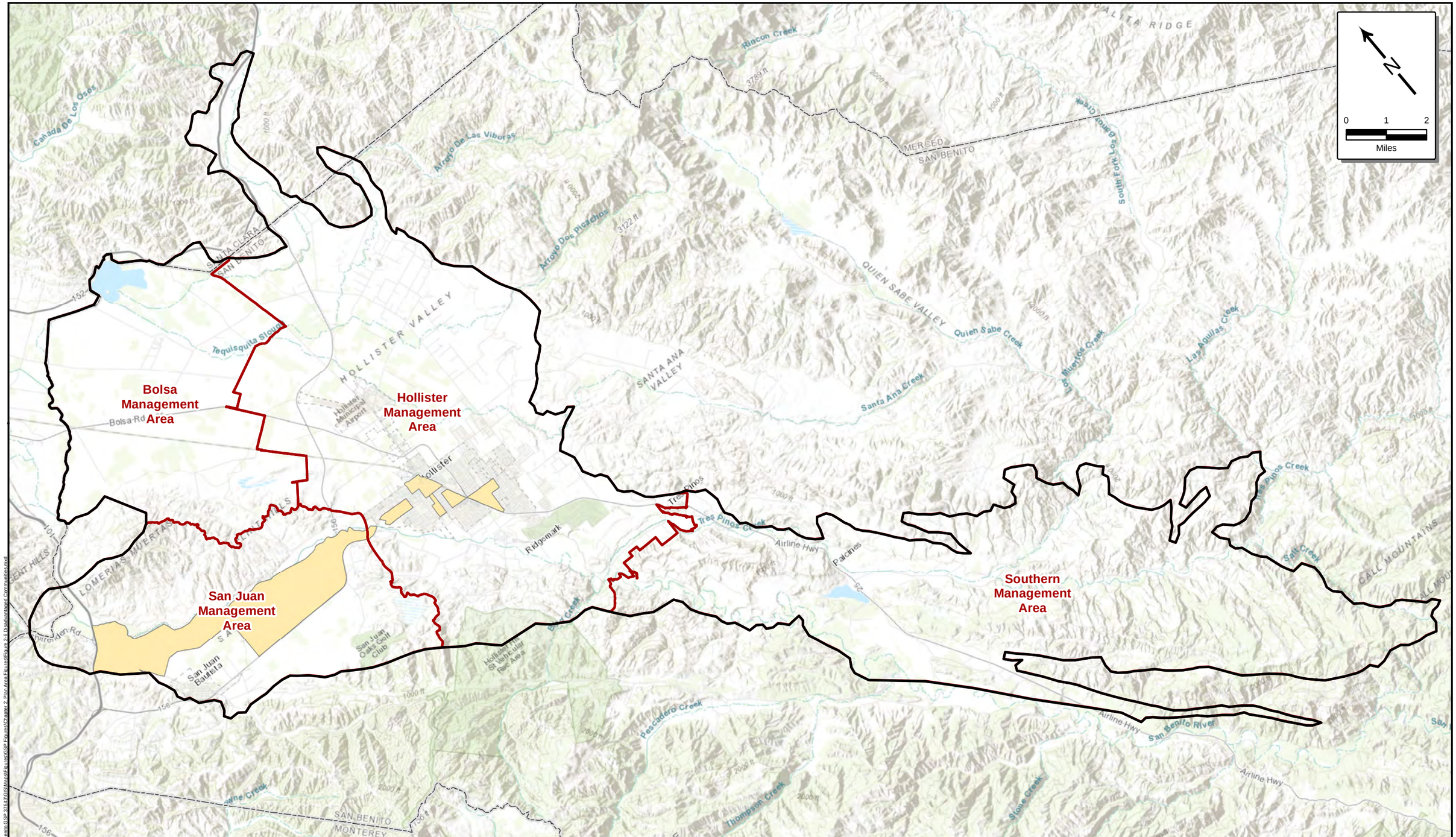
Figure 2-5
Estimated Density of Public Wells



Disadvantaged Community from 2016 and/or 2018 Census Block Groups

North San Benito Basin

Management Areas

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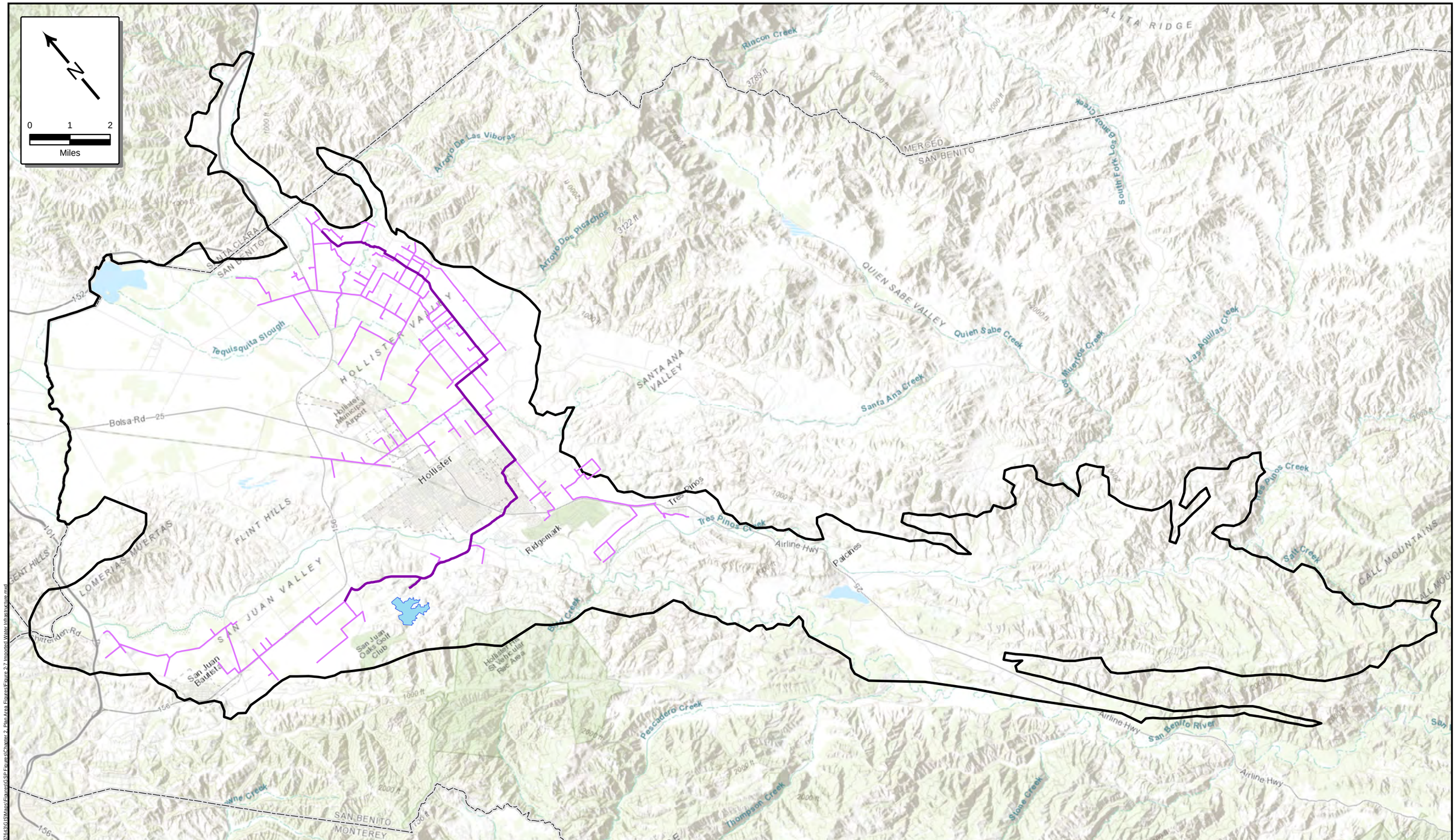
Figure 2-6
Disadvantaged Communities



San Justo Reservoir
San Felipe Water Hollister Conduit
San Felipe Water Distribution System
North San Benito Basin

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Figure 2-7
Imported Water Infrastructure

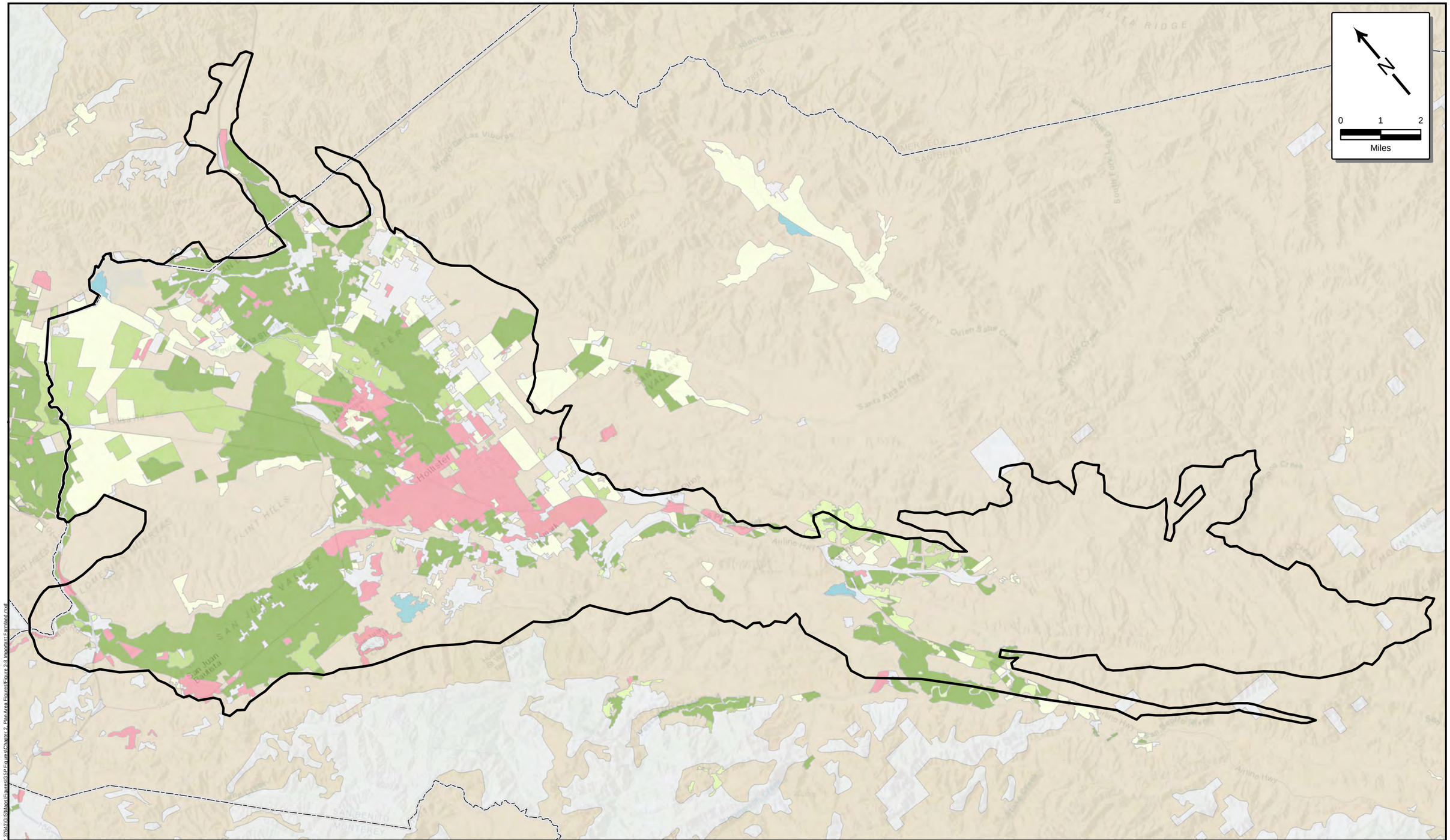

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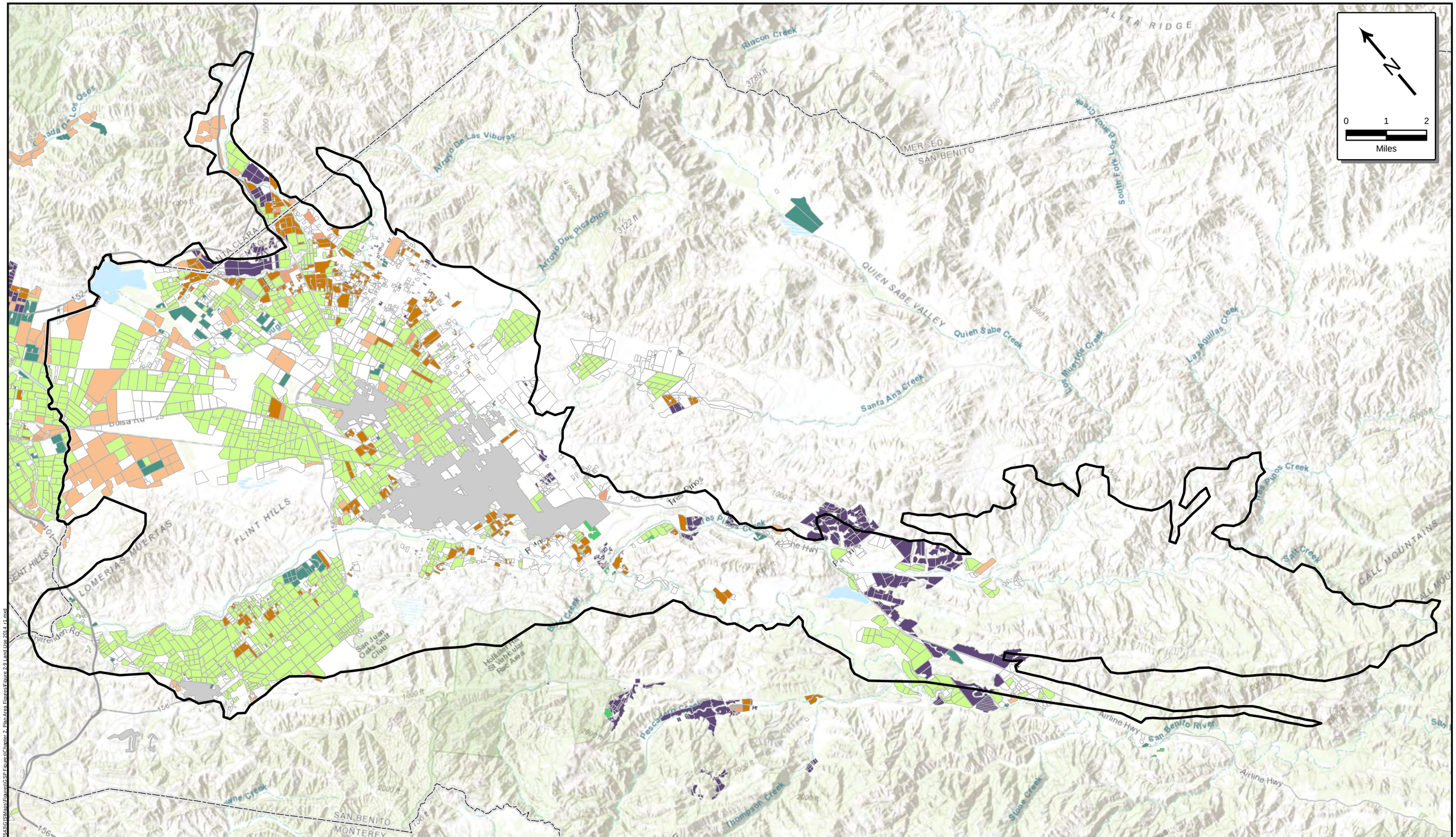
Figure 2-8
Important Farmland



Statewide Crop Mapping 2014 - *DWR Standard Legend (modified for remote sensing)*

- R | Rice
- P | Pasture
- G | Grain and Hay Crops
- T | Truck, Nursery, and Berry Crops
- F | Field Crops
- C | Citrus and Subtropical
- D | Deciduous Fruits and Nuts
- V | Vineyard
- Y | Young Perennial
- I | Idle
- NR | Riparian Vegetation
- U | Urban
- North San Benito Basin

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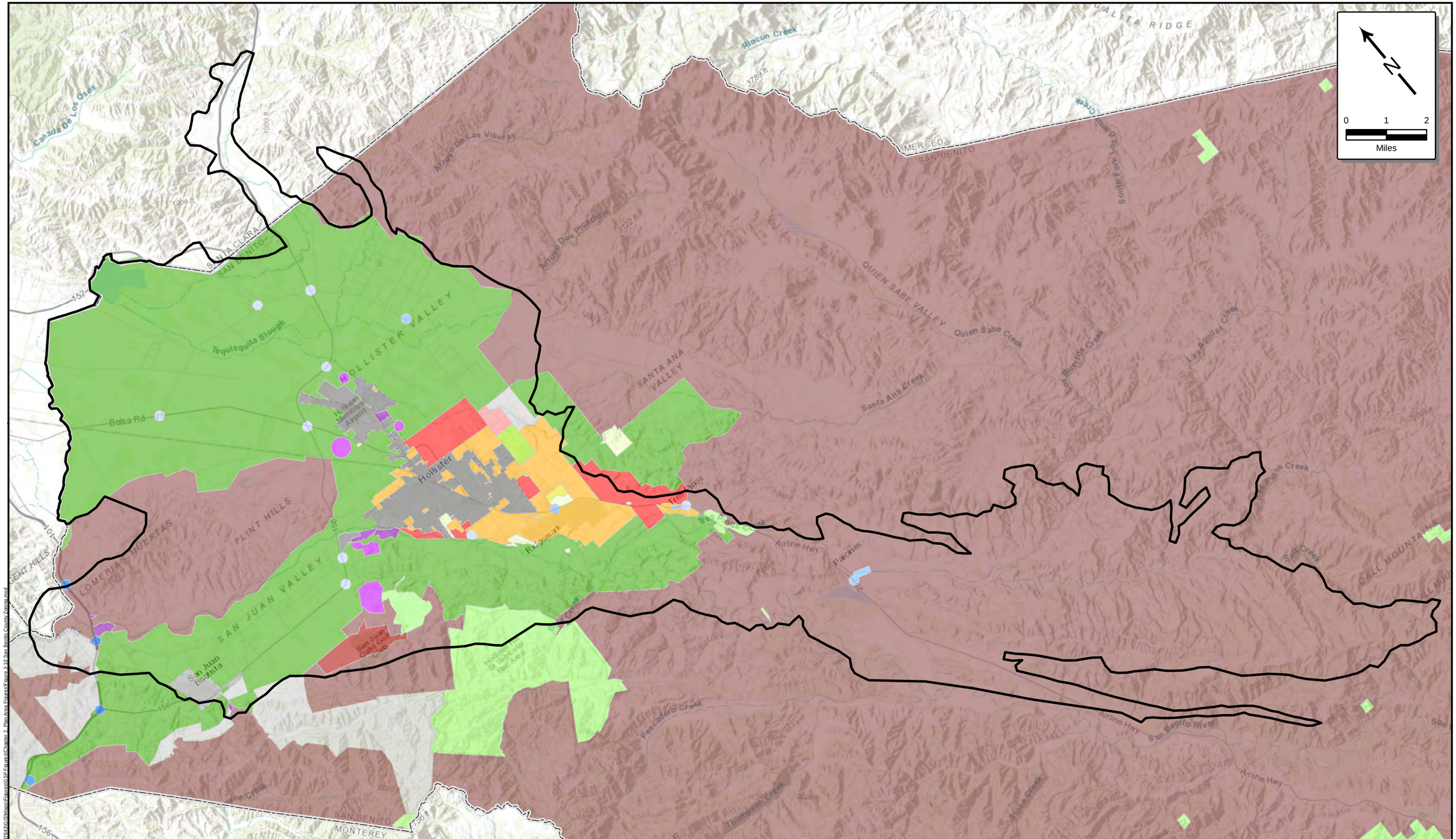
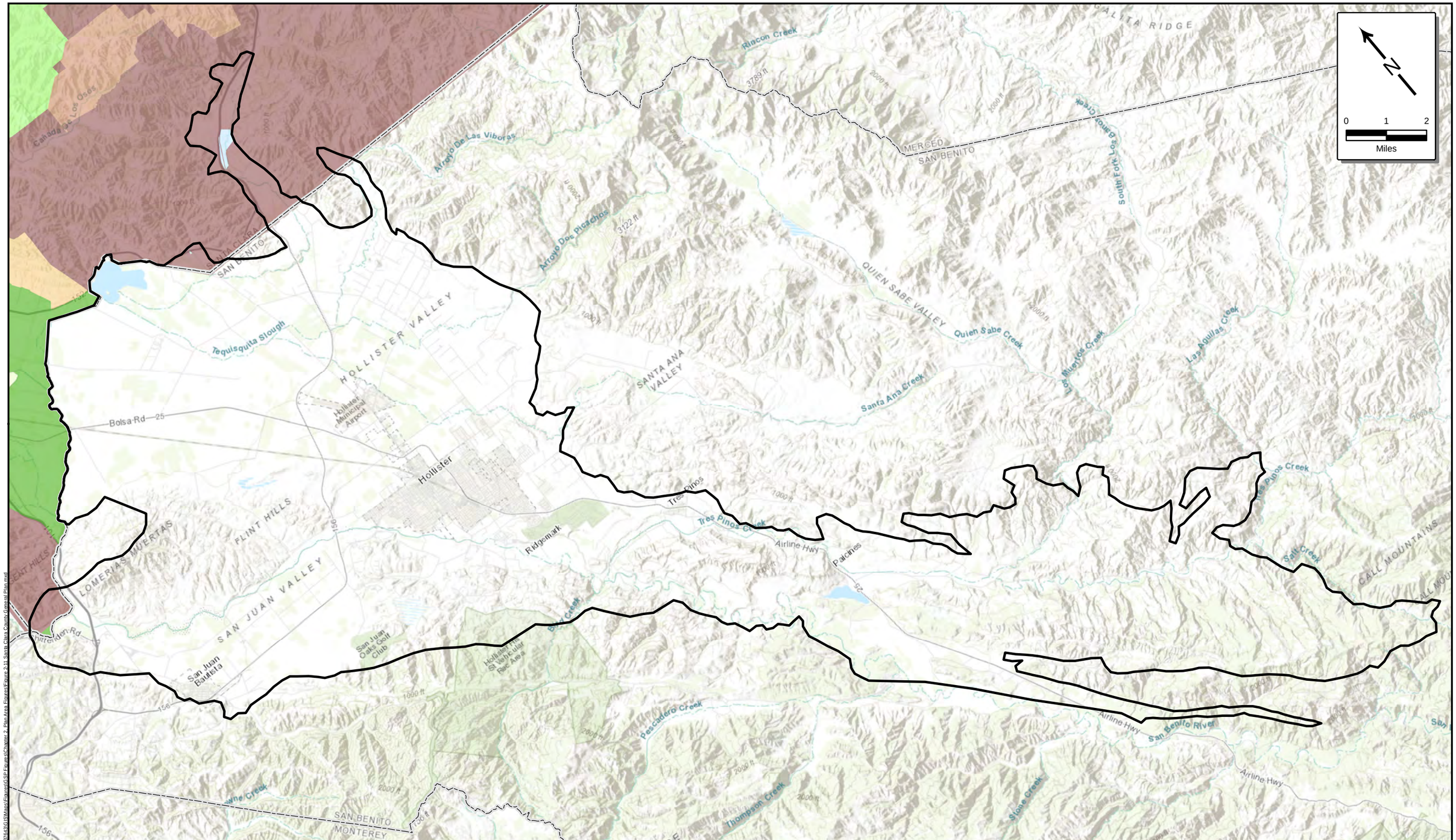
Figure 2-9
Land Use 2014



November 2021

TODD GROUNDWATER

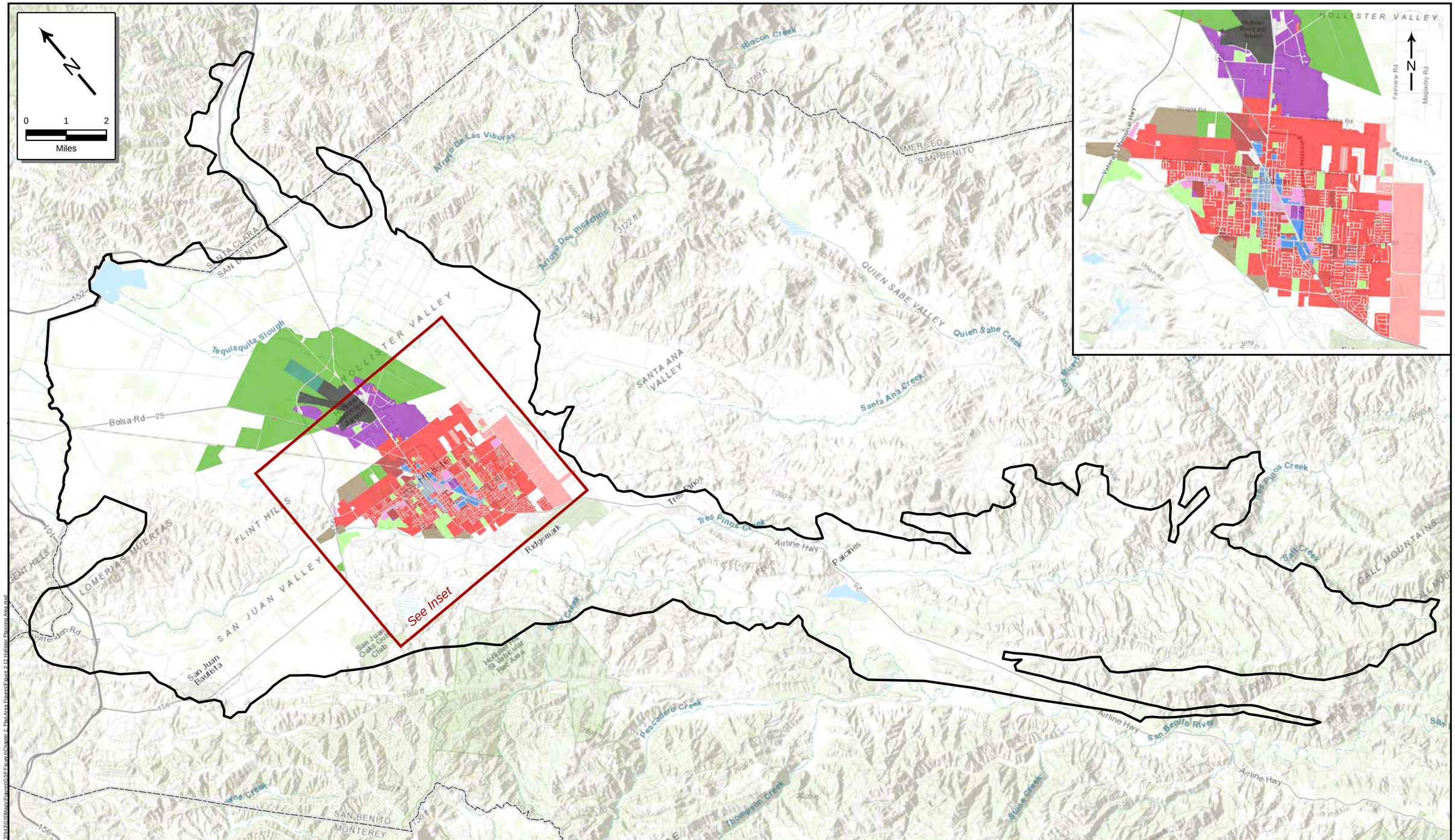
Figure 2-10
San Benito County General Plan Land Use



November 2021

TODD GROUNDWATER

Figure 2-11
Santa Clara County General Plan Land Use



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TODD GROUNDWATER

Figure 2-12
City of Hollister Planning Area

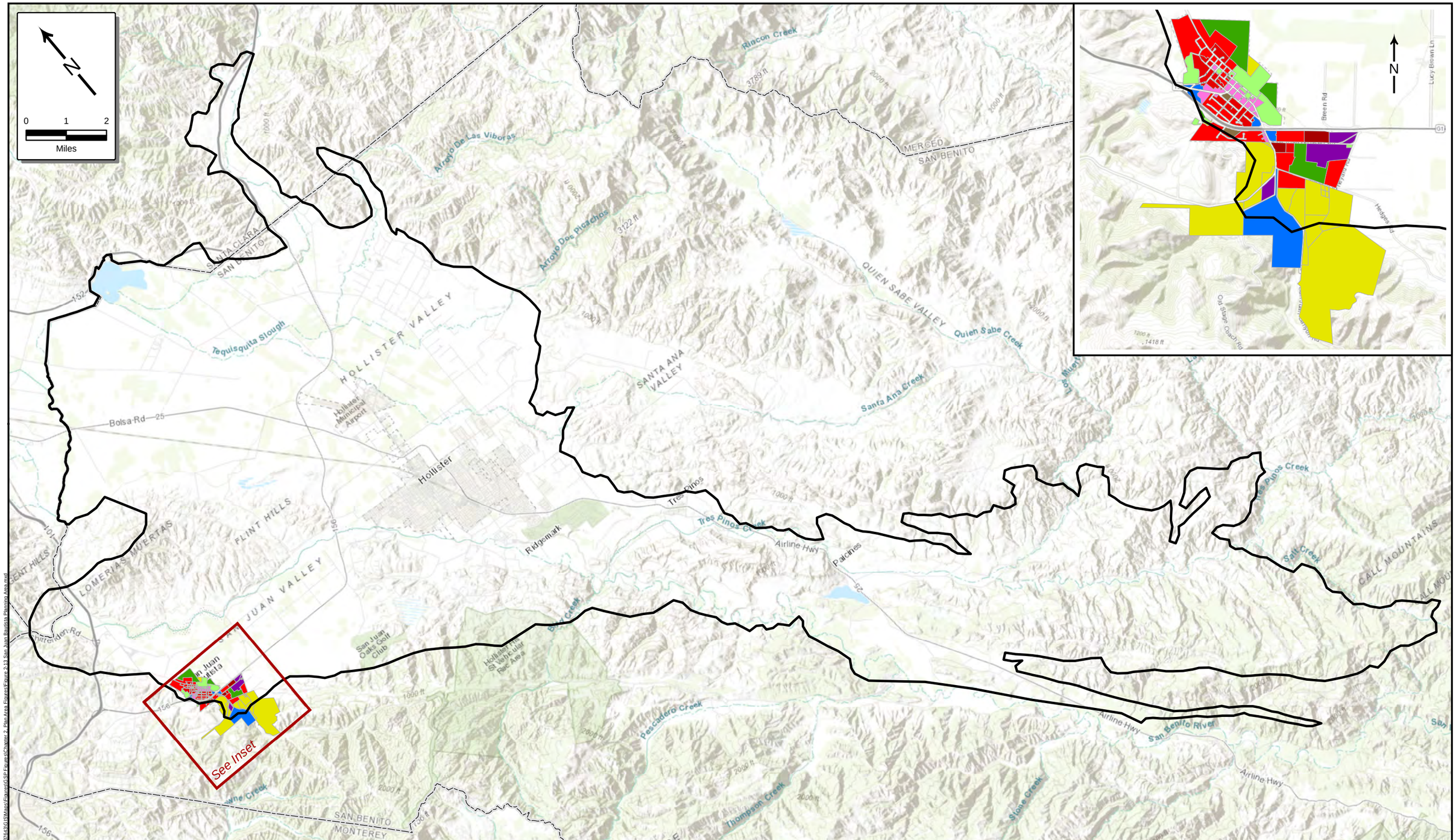

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Figure 2-13
City of
San Juan Bautista
Planning Area

3. HYDROGEOLOGIC CONCEPTUAL MODEL

This section describes the hydrogeologic conceptual model of the North San Benito Basin, including the Basin boundaries, geologic formations and structures, and principal aquifer units. The section also addresses the interaction between groundwater and surface water and discusses groundwater recharge and discharge areas. The Hydrogeologic Conceptual Model presented in this section is a summary of relevant and important aspects of the Basin hydrogeology that influence groundwater sustainability. While the Section 1 Introduction and Section 2 Plan Area establish the institutional framework for sustainable management, this section, along with Section 4 Groundwater Conditions and Section 5 Water Budget, sets the physical framework.

The hydrogeologic conceptual model and basin conditions serves to document the technical aspects of the basin's hydrogeology to create a foundation. Later sections including the water budget and sustainability criteria will refer to and rely on the technical material contained here.

3.1. PHYSICAL SETTING AND TOPOGRAPHY

The North San Benito Subbasin (Basin) of the Gilroy-Hollister Groundwater Basin (DWR, 2019a) covers approximately 200 square miles situated between and including portions of the Diablo Range to the east and the Gabilan Range to the west. It is adjoined on the north by the Llagas Subbasin, which is the northern extension of the Gilroy-Hollister Basin in Santa Clara County refs.

Figure 3-1 illustrates the topography of the Basin and surrounding uplands. The Basin is a series of connected north-northwest trending structural trough valleys; these contain unconsolidated to slightly consolidated sediments with primary porosity that store and transmit significant quantities of groundwater. These formations occur not just beneath the valley floor areas but also underlie some adjacent upland areas. Consequently, the Basin boundaries are defined mostly by geology and faults, not by topography. The northern boundary with Llagas Subbasin is institutional, defined by the county line; like the northernmost North San Benito Basin, the Llagas Subbasin underlies a relatively flat valley and consists of unconsolidated alluvial sediments. Almost all extraction and use of groundwater occur in the valley floor areas, both in the Basin and adjacent Llagas Subbasin.

The northern, main portion of the Basin (including urban areas and important farmland) is broad and flat and includes the San Juan and Hollister valleys and the Bolsa area (see **Figure 3-1**). The Llagas Subbasin north of the Basin continues another 15 miles northwest in Santa Clara County and include the cities of Gilroy and Morgan Hill. The San Juan Valley is separated from the Bolsa by the Lomerias Muertas and Flint Hills, which are an upward fold of older continental semi-consolidated to consolidated deposits that rises as much as 1,100 feet above the valley floor areas.

The semi-consolidated to consolidated materials also make up the hills along the southern edges of the San Juan and Hollister Valleys. The southern Basin is mostly hilly, including Swanson's Bluff where the basin narrows north of Paicines and extensive upland watersheds of Los Muertos and middle Tres Pinos creeks. The southern basin also includes the Tres Pinos Creek and Paicines valleys associated with Tres Pinos Creek and the San Benito River.

Ground surface elevations range from approximately 200 feet above mean sea level (msl) at the northern boundary to approximately 2,400 feet above msl in the southern uplands, as shown by 1000-foot contours on **Figure 3-1**.

3.2. Surface Water Features

Figure 3-2 shows surface water features including rivers, streams, springs, seeps, lakes, ponds, and reservoirs. The sub-watershed boundaries that drain into and through the Basin are shown on **Figure 3-3**.

As shown, the Basin covers a portion of the Pajaro River watershed. Main tributaries to the Pajaro River include the San Benito River, Tres Pinos Creek, Santa Ana Creek, Arroyo Dos Picachos, Pacheco Creek, and Tequisquita Slough. Llagas and Uvas creeks flow into the Pajaro River from the north in Santa Clara County. The San Benito River, Tres Pinos Creek, Pacheco Creek, and Tequisquita Slough are dry over most of their lengths for much of the year, flowing mainly during wet winter conditions.

3.3. Soils

Characteristics of soils are important factors in natural and managed groundwater infiltration (recharge) and are therefore an important component of a hydrogeologic system. Soil hydrologic group data from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) (NRCS, 2018) are shown on **Figure 3-4**. The soil hydrologic group is an assessment of soil infiltration rates determined by the water transmitting properties of the soil, which include hydraulic conductivity and percentage of clays in the soil, relative to sands and gravels. The groups are defined as:

- Group A – High Infiltration Rate: water is transmitted freely through the soil; soils typically less than 10 percent clay and more than 90 percent sand or gravel.
- Group B – Moderate Infiltration Rate: water transmission through the soil is unimpeded; soils typically have between 10 and 20 percent clay and 50 to 90 percent sand.
- Group C – Slow Infiltration Rate: water transmission through the soil is somewhat restricted; soils typically have between 20 and 40 percent clay and less than 50 percent sand.
- Group D – Very Slow Infiltration Rate: water movement through the soil is restricted or very restricted; soils typically have greater than 40 percent clay, less than 50 percent sand.

The hydrologic group of the soil generally correlates with the potential for infiltration of water to the subsurface. However, there is not necessarily a correlation between the soils at the ground surface and the underlying geology or hydrogeology.

3.4. Geologic Setting

The Basin lies within the Coast Ranges of California, a series of elongated ranges and valleys with a predominantly northwesterly trend. The Basin is structurally complex. The substantial depth of the Basin and the current topography of the land surface has resulted in part from folding of the geologic deposits. For example, the high hills that separate the Bolsa from the San Juan Valley are associated with the Sargent anticline (upward fold).

The topography is formed by folding and faulting of basement rocks in the area, leaving low-lying valleys that have been infilled with sediments. Basin fill material consists of unconsolidated to poorly consolidated alluvium of Tertiary and Quaternary age. The Quaternary alluvial deposits compose the valley floors and are the dominant geologic units in the Basin. The Basin also encompasses large areas of elevated hills composed of continental deposits. The surficial geology of the Basin and surrounding areas is shown on **Figure 3-5** (CGS, 2002).

The geologic materials that compose the Basin fill are primarily unnamed non-marine sediments of Pliocene age or younger (less than 5 million years old). The recent geologic mapping of the area by the California Geological Society (CGS) references these deposits simply by age (e.g., Puc, see **Figure 3-5**) (CGS, 2002). These formations are exposed at the land surface in the hills surrounding the valleys. In the eastern and southeastern parts of Hollister Valley, semi-consolidated deposits outcrop in the hills (e.g., Puc and Pus, see **Figure 3-5**) and are encountered in the subsurface that yield little groundwater and are commonly referred to as the San Benito Gravels of Lawson 1895.

Numerous investigators have recognized the difficulty in describing the subsurface stratigraphy of the alluvial valleys, due, in part, to sparse lithologic log data and a lack of distinctive textures and composition among the sedimentary units (Clark, 1924; Kilburn, 1972; Faye, 1974 and 1976; and LSCE, 1991). The most recent surficial geologic mapping of the Basin and surrounding area shows the Basin to include Holocene, Pleistocene, Plio-Pleistocene, and Pliocene continental deposits. These include relatively young alluvium (Q) stream gravel (Qg), basin deposits (Qb), older alluvium (Qo), and continental (QT) materials as well as mapped units of the Pliocene unnamed continental mudstone (Puc) and sandstone (Pus). Previous investigations and reports on the Basin have referred to these Pliocene deposits (Puc and Pus) as the Purisima Formation (Clark, 1924; Kilburn, 1972; Jenkins, 1973; Faye, 1974; Faye, 1976; Kapple, 1979; LSCE, 1991 and 2015; Todd, 1994a, 1994b, 2013, 2014, and 2015; JSA, 1998; and DWR, 2019a). However, the most recent surficial geologic mapping (CGS, 2002) does not include the Purisima in or around the Basin (CGS does include the Purisima Formation in other areas covered by this geologic map). Hereafter, the material mapped as Puc and Pus will be referred to as the Purisima Formation unless otherwise noted.

The surficial geology of the area surrounding the basin includes a number of named formations deposited between the Jurassic and Miocene (approximately 200 million to 5 million years old). These include the Mio-Pliocene Etchegoin Formation; the Miocene Quien Sabe Volcanics basaltic flows, breccias, intrusive andesites, and intrusive basalts; the Oligocene Vaqueros Sandstone; Eocene-Oligocene San Juan Bautista Formation; Eocene Unnamed Sedimentary rocks, Kreyenhagen Formation, Los Muertos Formation, and Tres Pinos Sandstone; Paleocene-Eocene Sedimentary rocks; Upper Cretaceous sedimentary rocks; Cretaceous Panoche Formation and multiple member of the Franciscan Complex; and Jurassic Coast Range Ophiolite Gabbro and the Hornblende Gabbro of Logan quarry. These geologic formations represent a wide variety of consolidated sedimentary, volcanic, and metamorphic rocks with low primary porosity, forming the lateral and vertical boundaries of the Basin.

3.5. FAULTS

The geology and hydrogeology of the Basin is complicated by intensive faulting and deformation along faults, most notably the Calaveras and San Andreas fault zones (LSCE 1991). As shown in **Figure 3-5**, the Calaveras Fault bisects the Hollister Valley from north to south and offsets the hills west of the Hollister Airport. It also has created San Felipe Lake, a sag pond at the north end of the valley (**Figure 3-2**).

Geologic mapping (**Figure 3-5)** indicates that the Calaveras fault consists of several parallel splinters throughout the length of the Basin. The San Andreas Fault crosses a portion of San Juan Valley but is generally west of the western boundary of the Basin.

Other faults related to the San Andreas/Calaveras system have shaped the eastern side of the Basin. Some of these faults have been mapped only in the outcropping bedrock, and fault traces across the valley floor are uncertain. These include the Ausaymas Fault (sometimes referred to as the Quien Sabe), Tres Pinos Fault, and the unnamed fault traces associated with the Lomerias Muertas and Flint Hills.

3.6. AQUIFERS

The geologic materials underlying the Basin do not fall neatly into two categories of permeability, such as bedrock and basin fill. Some upland areas (such as the Lomerias Muertas, Flint Hills, and hills in the upper Tres Pinos Creek and San Benito River drainages) are simply upward folds of the same formations that represent aquifers in the valley areas. These upland areas store and transmit some groundwater to the valley portions; in brief, the Basin includes valley areas composed of Holocene and late Pleistocene alluvial deposits with relatively high permeability and upland areas with mainly Pliocene-Pleistocene continental deposits of moderate permeability. The Flint Hills and most of the southern portion of the Basin also encompass elevated areas of relatively low permeability Pliocene continental deposits, which yield less groundwater.

The valley-fill units were deposited in alluvial fan and fluvial environments from a variety of source rocks and directions. These deposits interfinger in the subsurface, making the differentiation of discrete aquifer packages difficult on a regional basis. This also results in variable aquifer properties across the Basin, even within the generally higher permeability valley fill alluvium (LSCE, 1991; Faye, 1974; and Todd, 2013).

3.6.1. Principal Aquifers

The Holocene alluvial sedimentary sequences represent the principal aquifers; their distribution is shown on **Figure 3-5**. As shown, the principal aquifers underlie the Hollister and San Juan valleys and the Bolsa. These unconsolidated alluvial deposits consist mainly of clay, silt, sand, and gravel ranging in age from Tertiary to Holocene. The Purisima and other Pliocene deposits are presumed to be present at depth beneath the alluvial deposits. However, distinguishing these older semi-consolidated materials from younger alluvial materials in borings or geophysical logs is difficult and there is no geologic interpretation that is known and widely accepted. The oldest of the principal aquifers lie unconformably on consolidated bedrock of Jurassic, Cretaceous and early Tertiary age (Kilburn, 1972 and Todd, 2013). These unconformable contacts generally occur below the depth of groundwater wells in the Basin and accordingly, definitive information or mapping of the Basin bottom is lacking. This is discussed in more detail below.

Groundwater in the principal aquifers generally occurs in both unconfined and confined conditions. Surficial clay deposits, especially in the Bolsa area and Hollister and San Juan Valleys, create non-continuous confining layers. In the northern Hollister Valley and San Juan Valley, artesian conditions locally result in flowing wells and nuisance shallow groundwater that requires near-surface drains.

3.6.2. Secondary Aquifers

As indicated above, the Pleistocene and Pliocene age Purisima Formation and other continental (non-marine) deposits are also important aquifers within the Basin. These secondary aquifers are composed of clay, silt, sand, and gravel (LSCE, 1991; Todd 2013 and 2015). They are a thick sequence of clay, silt, sand, and gravel mapped in the southern portion of the Basin as unnamed Pliocene continental mudstone (Puc) and sandstone (Pus). In some areas of the Basin, these semi-consolidated rocks have been divided into three unnamed units, from oldest to youngest: unit 1, unit 2, and an undifferentiated unit (Kilburn, 1972; DWR, 2019a).

3.6.3. Physical Properties of Aquifers

Summary descriptions of the aquifer formation are provided below. Few reliable aquifer parameter measurements are available from wells within the Basin; accordingly, assessment of aquifer parameters has been undertaken in association with numerical model construction and calibration. The available aquifer parameter information and distribution within the Basin are described in the numerical model documentation report, North San Benito Basin Groundwater Model Update and Enhancement 2020, included in **Appendix G**.

Holocene Alluvium, principal aquifer:
The alluvium consists of unconsolidated lenticular beds of gravel, sand, silt, and clay deposited by streams as flood plain, alluvial-fan, slope-wash, and terrace deposits (Kilburn, 1972). Saturated deposits are moderately to extremely permeable. The thickness generally ranges from 0 to 300 feet (JSA, 1998).

Purisima Formation, secondary aquifer:
The Purisima Formation and other Pliocene continental deposits, while lithologically similar to the overlying alluvium, are generally more consolidated and less permeable (JSA, 1998). The Purisima Formation ranges from the surface in some areas to several thousand feet deep; in the Bolsa it is believed to directly overlie consolidated basement rocks of Jurassic age (Kilburn, 1972).

Unit 1 and Unit 2, secondary aquifer:
Unit 1 crops out and is believed to form the low hills at the north end of Santa Ana Valley and to underlie unit 2. Unit 1 is approximately 1,200 feet thick. The log of well 12S/5E-23A3 indicates the top of the unit at a depth of 420 feet at this location (Kilburn, 1972). Unit 1 is made up of clay, sand, and gravel with individual beds not more than five to ten feet thick. Unit 2 consists of three or four thick sand sequences separated by thinner clay intervals. Units 1 and 2 are not known to occur west of the Calaveras fault.

Undifferentiated Unit, secondary aquifer:
Kilburn (1972) describes the undifferentiated unit as including one or more of the following units: alluvium, older alluvium, San Benito Gravels, and alluvial-fan material that may occur in the subsurface along the front of the Diablo Range. This unit is believed to overlap and rest unconformably on an older erosion surface formed on units 1 and 2.

3.7. Structures Affecting Groundwater

The complex depositional and tectonic history of the Basin have resulted in numerous structures that potentially affect the flow and transmission of groundwater. The primary structures affecting groundwater are lower permeability aquifer materials and faults.

As described above, the presence of lower permeability aquifers and the contacts between these aquifers and overlying primary aquifers are difficult to discern because of their similar compositions. Accordingly, no distinct aquitards are known or have been mapped at depth and the surficial geologic mapping shown on **Figure 3-5** is the best representation of the presence of these materials in the Basin.

Faulting has been indicated to affect groundwater flow within the Basin in some locations and in some conditions (LSCE, 1991 and Todd, 2015). Evaluation of groundwater elevations across fault traces has shown that large groundwater gradients sometimes exist on portions of the Calaveras Fault in the north of the Basin (LSCE, 1991 and Todd, 2015). However, evaluation of current groundwater conditions in wells on both sides of the Calaveras Fault indicate that if the fault is a barrier, then it primarily affects flow when groundwater elevations are low. Groundwater model construction and calibration also indicated relatively large vertical gradients near uncertain traces of the Ausaymas/Quien Sabe and Tres Pinos Faults (Todd, 2015). However, most of the paired wells with large vertical gradients are far apart and it is unclear if the observed gradients are the result of barriers associated with faulting, differences in lithology and well construction, or some other permeability changes.

3.8. Definable Basin Bottom

The depth to consolidated Tertiary units and other bedrock units beneath the alluvium and Plio-Pleistocene sediments is not well characterized. Kapple (1979) indicates that the Quaternary-age aquifers (including the unconsolidated basin fill, San Benito Gravels, and an undifferentiated sedimentary unit) range in thickness up to 1,300 feet in the Hollister Valley. Data from exploratory oil wells indicate that basin fill sediments extend as much as 4,000 feet below the ground surface near the center of the Basin, far beyond the depths of water supply wells (Kilburn, 1972). Generalized cross sections prepared for a San Benito County Groundwater Study (LSCE, 1991) that covered a portion of the Basin generally corroborate this interpretation with alluvium estimated to average about 700 feet thick in the Bolsa area and Hollister Valley.

In the northern San Juan Valley, the alluvium appears to be thinner than in the Bolsa and Hollister Valley areas and is estimated to be about 400 feet thick. Wells deeper than this in the northern San Juan Valley may be producing water from the underlying consolidated formations (Purisima and others as indicated above). The Purisima Formation is thought to reach thicknesses in the subsurface of more than 1,500 feet in the northern portion of the San Juan Valley (Kilburn, 1972); although, most of the wells are less than 350 feet deep. No wells are known in the Flint Hills northeast of San Juan Valley; however, one well located on the west side of San Juan Valley is screened in the same continental mudstones formation that underlies the Flint Hills and is 300 feet deep.

The depth of the southern Basin is not well characterized. Several irrigation wells in the Paicines Valley penetrate alluvial deposits to depths ranging from 100 to 500 feet below ground surface (ft-bgs) (LSCE, 1991). A review of driller's logs in the area indicated an average alluvial depth of 400 feet (Todd, 2013). The alluvial thickness in the Upper Tres Pinos Creek area is thought to be less than 100 feet (LSCE, 1991); however, Pliocene or early Pleistocene continental sediments of moderate permeability underlie the

remainder of the Upper Tres Pinos Creek Watershed. Based on a review of driller's logs, the average well depth in this area is about 300 feet (Todd, 2013).

LSCE (1991) reports that wells in the Tres Pinos Valley (then defined as a separate basin) encounter alluvial deposits ranging from 135 to 630 ft-bgs. California Department of Water Resources (DWR) (2019a) reports that the alluvial material is generally less than 100 feet thick. A review of the few driller's logs in the area (Todd, 2013) indicates an average depth to bedrock of 360 feet.

3.9. Cross Sections

Four hydrogeologic cross sections were constructed to characterize the thickness and distribution of aquifer sediments and to delineate the hydrostratigraphy within the Basin (**Figure 3-6**). The goals of constructing cross sections were to identify hydrogeologic structures affecting groundwater and to confirm aquifer descriptions presented above. Construction of the cross sections focused on conditions relevant to hydrostratigraphic layering in the Basin. The assessment was designed to use and combine existing information in the ArcHydro Groundwater data format that supports application of geographic evaluation tools within a Geographic Information System (GIS) platform. The information assessed in this evaluation included:

- Surficial geology
- Faulting
- Lithologic borehole logs
- Well construction logs
- Previously completed local hydrogeologic conceptualizations.

This information was collected and translated into a unified GIS compatible database structure for cross section construction and geographic evaluation. This approach allows any hydrostratigraphic structures relevant to groundwater flow in the Basin to be easily translated from GIS for use in other formats.

3.9.1. Available Data and Information

Existing datasets and information were collected from all available sources. These sources included the following:

- Surficial geology in GIS coverage format (CGS, 2002)
- Fault locations and orientations (CGS, 2002)
- Fault subsurface expressions (Wallace, 1990)
- Lithologic and well construction logs from SBCWD
- Drillers Log files from DWR
- National Elevation Dataset (NED) ground surface digital elevation model data for San Mateo and Santa Clara Counties (USGS, 2018).

These data and information sources resulted in a dataset of over 2,400 locatable wells and boreholes within and near the Basin. Of these, lithologic and construction records were digitized for 374 wells and boreholes (**Figure 3-6**). These location, lithologic, and well construction records were combined into a unified dataset covering the Basin and surrounding areas. The unified dataset is composed of a series of related tables in a geodatabase that follows the data storage conventions of ArcHydro Groundwater.

Construction of the unified database required combination of well location, lithologic, and well construction data from multiple data sources. These data sources often contained different information types. At each stage of the database construction process, care was taken to include all data from each data source. In addition, many records were included in multiple data sources, and often the records from two or more data sources had differences in locations or information for wells. Duplicate well locations or records were combined into single records preserving all information from each individual data source.

Multiple faults cross portions of the Basin, as discussed above. To portray these faults on cross sections, it was necessary to estimate orientations and approximate dip angles. Wallace (1990) includes approximate information regarding the subsurface expressions of the Calaveras and San Andreas Faults within the area of the Basin. Wallace estimates that the Calaveras generally dips 80 degrees to the east and the San Andreas dips 70 degrees to the west.

3.9.2. Cross Section Construction

The four cross section transect locations shown on **Figure 3-6** were selected based on available data to provide lithologic coverage throughout the Basin. These cross sections cross and extend slightly beyond Basin boundaries and are designated as A to A' through D to D', as indicated on **Figure 3-6**.

The datasets incorporated into the database discussed above were used to populate the cross sections for use in hydrostratigraphic correlation. These data were applied to the sections using the ArcHydro Groundwater extension to ESRI's ArcGIS Desktop software. ArcHydro Groundwater includes tools for plotting surficial geology, faults, lithologic, construction, and elevation surfaces from a two-dimensional map to two-dimensional cross sections. The wells with lithologic and construction information in the vicinity of the cross sections are shown on **Figure 3-6**. Each cross section was populated with the following datasets:

- Ground surface elevations from the county NED files
- Surficial geology
- Faults
- Well and borehole lithology and well construction from all wells within 1,000 feet of each cross section, except cross section A to A' where the few wells present were projected over larger distances.

These data were plotted to the cross sections using the ArcHydro Groundwater toolset and then used to interpret and correlate hydrostratigraphy. Lithologic data were used to interpret sand and gravel aquifer units throughout the Basin. Sands and gravels were lumped together in the interpretation. In locations where multiple lithologic logs were present on a cross section, preference was given to the closest logs. Mapped surface geology (CGS, 2002) and subsurface conditions around the faults were used to interpret the locations and relationships of older materials to one another and alluvium.

The resulting cross sections are shown individually with well construction, hydrostratigraphy, faulting, and bedrock on **Figures 3-7** through **3-10**. Areas with no well or lithologic data are blank and the transition is indicated by a dashed line. Cross section A to A' is the longitudinal profile down the length of the Basin; it is noteworthy in showing the significant topographic change from south to north and rugged character of Basin upland areas. This longitudinal profile is semi-parallel to the Calaveras Fault

and intersects the Calaveras Fault zone. The other transverse cross sections illustrate the stratigraphy below the Basin's main valleys insofar as data are available.

3.9.3. Hydrostratigraphic Evaluation

The cross sections are consistent with and support the conceptual model described above. These sections show that most of the Basin is composed of a mix of interbedded silts and clays (fine grained materials) and sands and gravels (coarse grained materials) in discontinuous lenticular deposits. In general, a higher percentage of sand and gravel occurs near the San Benito River and Tres Pinos Creek, as would be expected. The cross sections also show that distinguishing the primary alluvial aquifer from the same type of materials in the older underlying aquifers is infeasible with available information. Additionally, the cross sections show that most water wells do not extend deep enough to document the full thickness of the water bearing materials that make up the aquifers of the Basin.

3.10. Recharge and Discharge Areas

Groundwater recharge occurs over the entire surface of the Basin, in varying intensities. It can be conceptualized as consisting of three components based on their footprints: areas, lines, and points. These categories and their locations are shown in **Figure 3-11**. Dispersed recharge over broad areas derives from deep percolation of rainfall and applied irrigation water beneath the root zone of plants. Estimates of this areal flux are quantified in Section 5 Water Budget, for hundreds of polygon areas representing different combinations of soil, water, and vegetation. Land use plays a significant role in the recharge flux, and the figure shows three categories of land use that generally have different magnitudes of recharge: non-irrigated natural vegetation (low), urban areas (medium), and irrigated cropland (high).

Percolation from streams is a major source of recharge to the Basin, and streams are shown as linear features on the map. Percolation from small streams in upland areas is estimated in the water balance analysis from a rainfall-runoff-recharge model, and percolation from larger streams in valley floor areas is estimated using the groundwater model.

Percolation from ponds can be represented as points at the scale of the entire Basin. SBCWD has conducted managed aquifer recharge at the Tres Pinos Pond near Tres Pinos, Union Road Pond near the San Benito River, Hollister ponds, and Frog Pond near Arroyo de Las Viboras. Percolation ponds also include wastewater treatment plant disposal ponds. The recharge map shows the locations of six wastewater percolation ponds serving San Juan Bautista, Hollister, the Ridgemark development, and Tres Pinos.

Finally, subsurface inflow to the Basin probably occurs at various locations around its perimeter. The water balance section describes how this flux was estimated by applying the rainfall-runoff-recharge model to tributary watershed areas and how it was assumed to be distributed along the Basin perimeter in the groundwater model.

Groundwater recharge can be increased through management actions and projects, termed Managed Aquifer Recharge (MAR). As described in the Plan Area (Section 2.1.4), SBCWD has a long history of percolating surface water to augment recharge, mostly in or near stream channels. MAR activities are likely to be continued and enhanced in the future; potential projects will be addressed in Section 8, Management Actions and Projects.

With regard to discharge, wells are by far the largest discharges from the Basin, and they are abundant in the urban and agricultural areas shown on the recharge map, **Figure 3-11**. Natural outflow from the Basin consists of groundwater discharge into creeks and rivers. The primary exit points are groundwater seepage into the lower ends of the Pajaro and San Benito Rivers as they approach the northwestern end of the basin and enter the bedrock canyon leading to the coast. Locations of gaining reaches of streams are mapped and discussed in Section 4.11, Interconnection of Surface Water and Groundwater.

3.11. Primary Groundwater Uses

The primary groundwater uses in the Basin include municipal, agricultural, rural residential, small community water, and small commercial purposes. Municipal and agricultural demand in the Zone 6 portion of the Basin is met by a combination of imported water from the Central Valley Project (CVP) and groundwater. Outside Zone 6, water demand for all uses comes entirely from groundwater. Groundwater production for all users comes largely from the principal aquifer in the central and northern portions of the Basin. In upland areas and smaller valleys of the Basin, production comes from the principal and secondary aquifers.

3.12. Data Gaps in the Hydrogeologic Conceptual Model

The hydrogeologic conceptual model has identified gaps in available information, listed below. However, these gaps do not affect the ability to manage the Basin or demonstrate sustainability.

- The bottom of the Basin is poorly defined throughout and no mapping of the elevation of the Basin bottom exists. Significant exploratory drilling beyond the typical depth of water wells in the Basin or extensive detailed geophysical work would be required to fill this gap.
- The extent, thickness, and relationship between the principal and secondary aquifers has not been well delineated beyond surficial geologic mapping. As with the Basin bottom, filling this gap would require significant exploratory drilling and/or geophysics.
- The effect of faults on groundwater flow—which varies both geographically and vertically—is not well documented. The available groundwater monitoring wells are not appropriately located or constructed for the purpose of performing detailed high-quality evaluations of the effects of faults throughout the Basin under a variety of groundwater conditions.

North San Benito Basin

Llagas Area Subbasin of the Gilroy-Hollister Basin

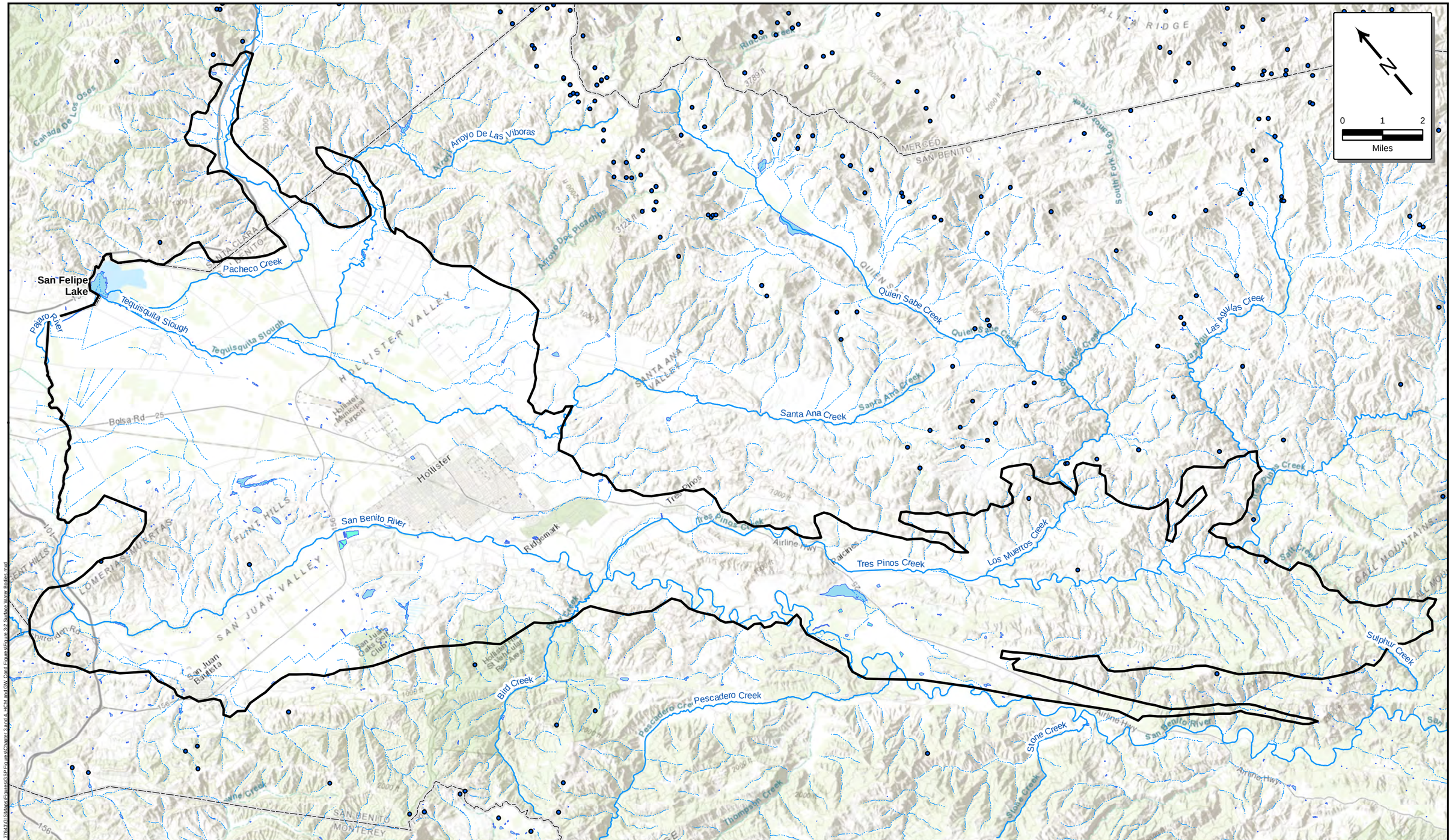
San Benito County

Topographic Contour (Bold on 1000 foot interval)

November 2021

TODD GROUNDWATER

Figure 3-1
Basin Topography

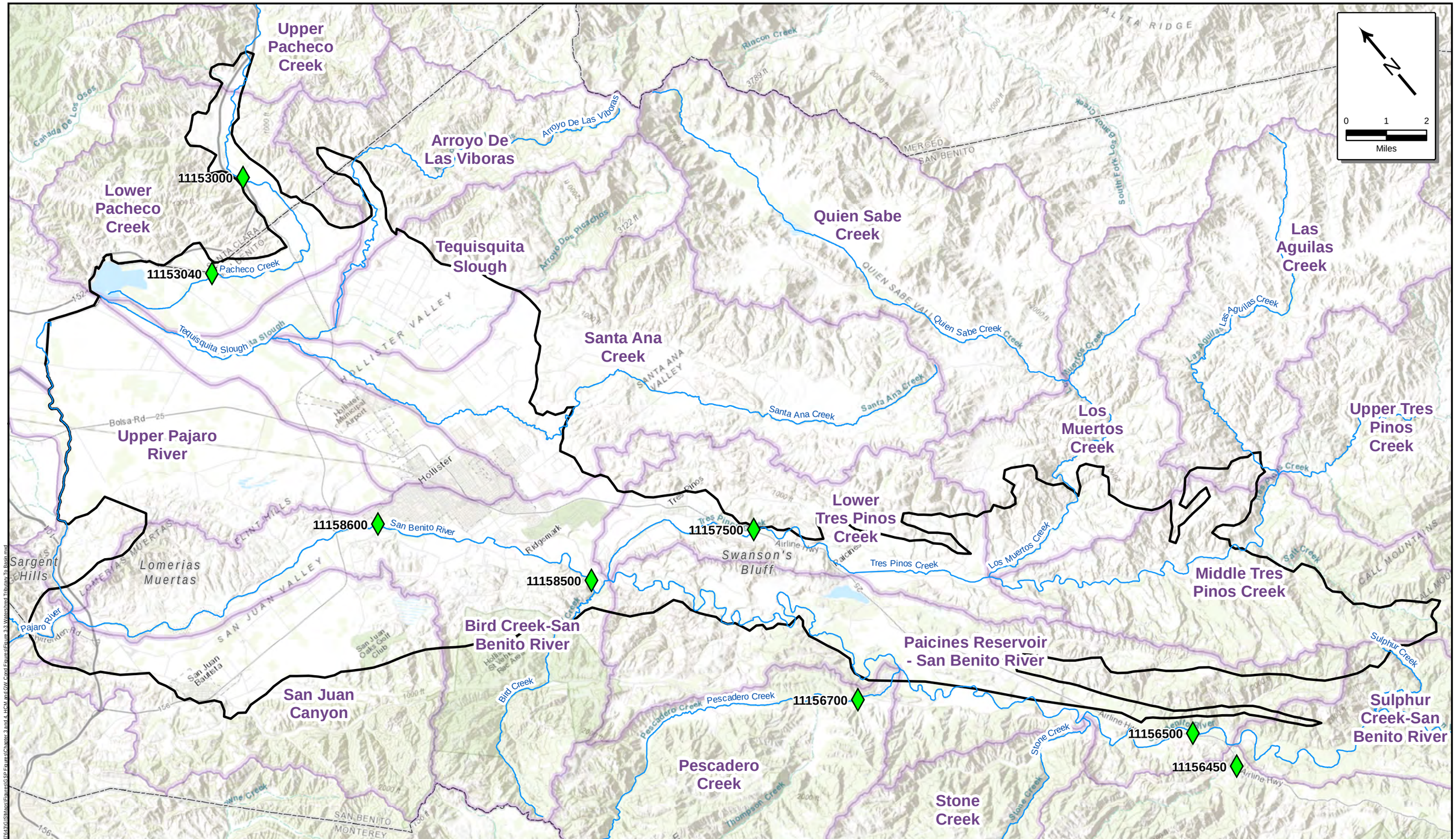


Major Streams and Rivers
Spring or Seep
Lake or Pond
Reservoir
North San Benito Basin
San Benito County

November 2021

TODD GROUNDWATER

Figure 3-2
Surface Water Bodies Tributary To Basin



Stream Gauges in Basin

Major Stream

North San Benito Basin

Tributary Watershed Boundaries

San Benito County

November 2021

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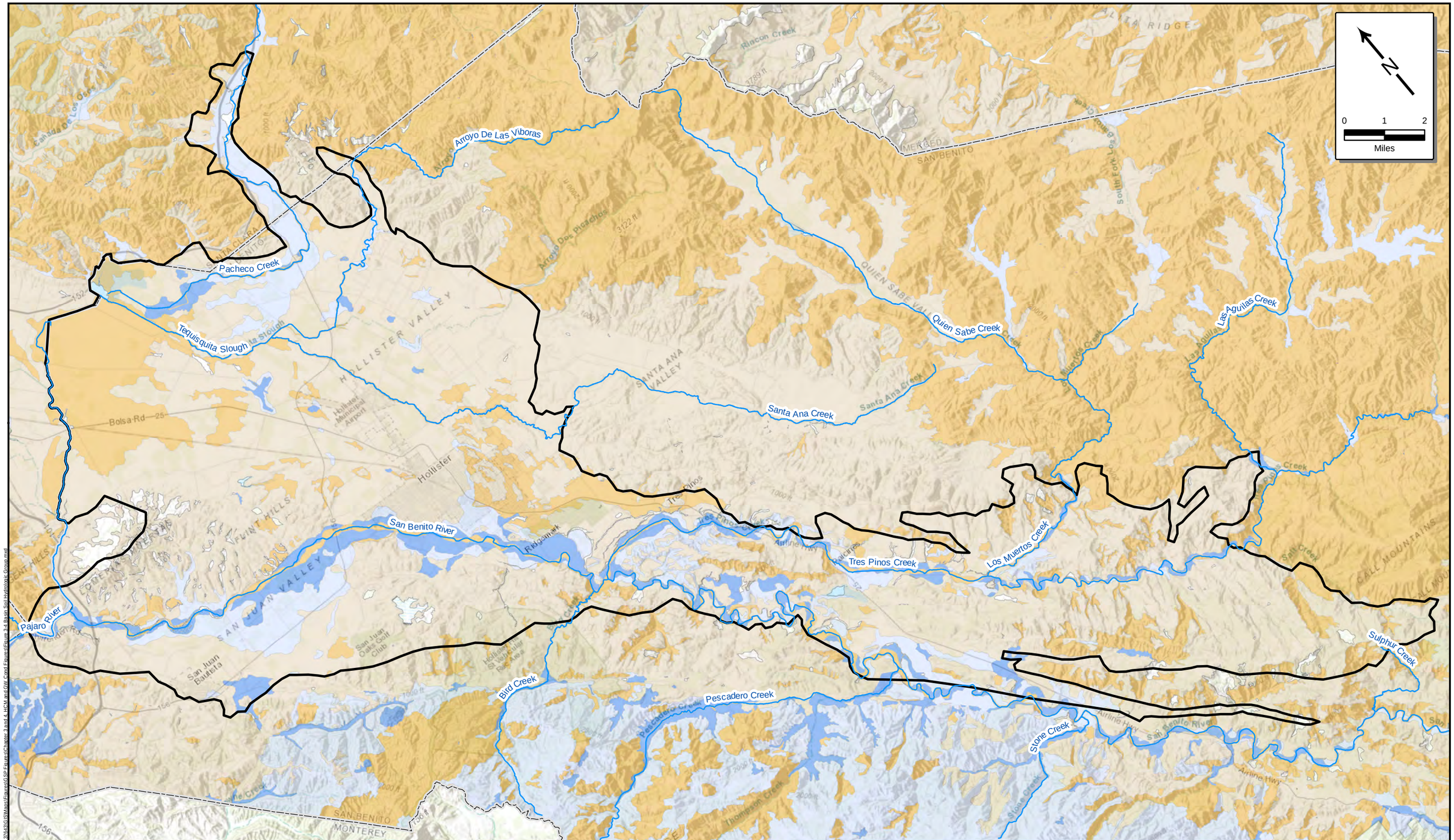
Figure 3-3
Watersheds Tributary to Basin



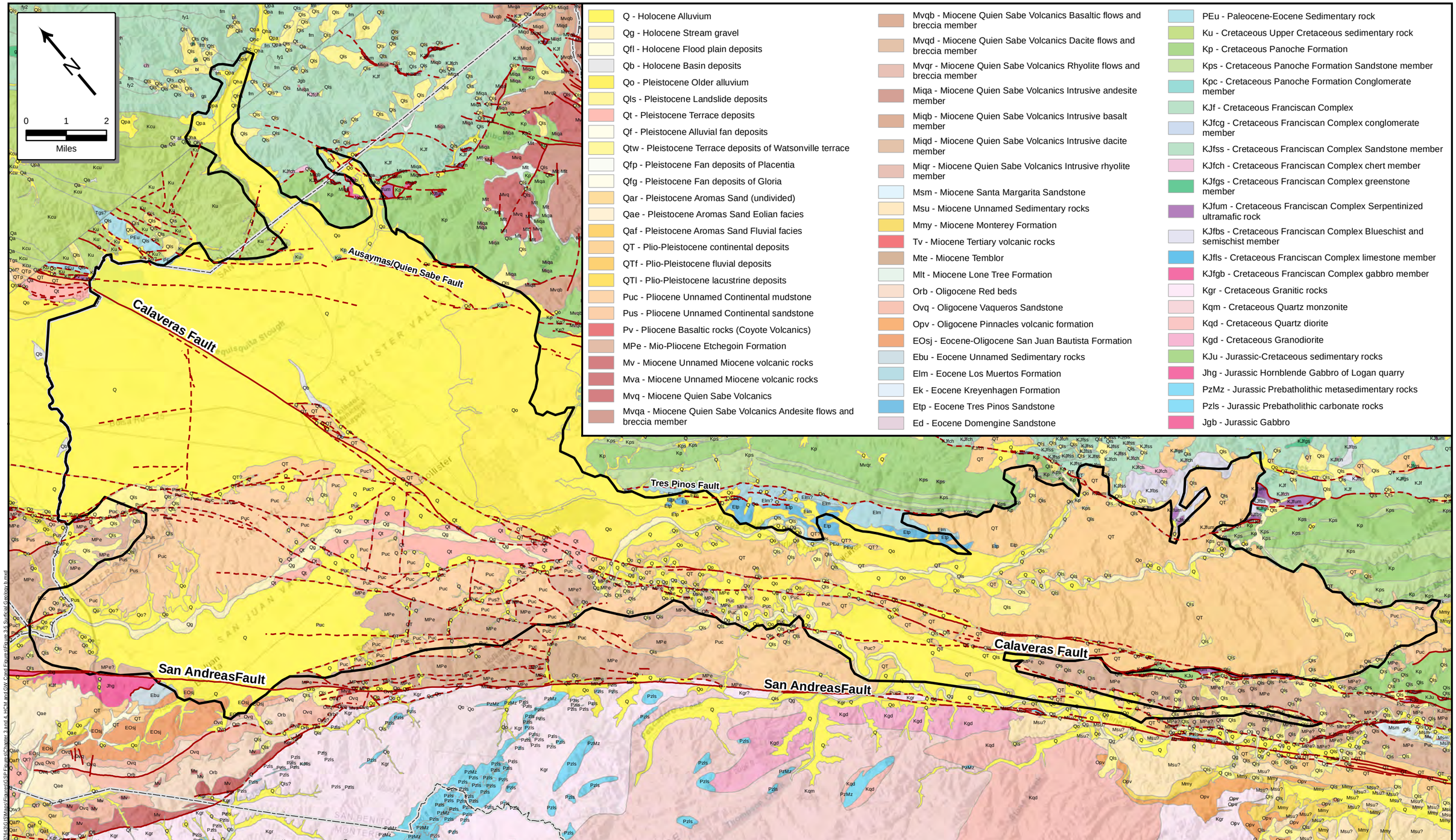
Soil Hydrologic Group

- A: High Infiltration Rate
- B: Moderate Infiltration Rate
- C: Slow Infiltration Rate
- D: Very Slow Infiltration Rate
- No Data
- North San Benito Basin
- San Benito County

November 2021

TODD GROUNDWATER

Figure 3-4
Basin Soil Hydrologic Properties



Fault Location, dashed where uncertain

North San Benito Basin

November 2021

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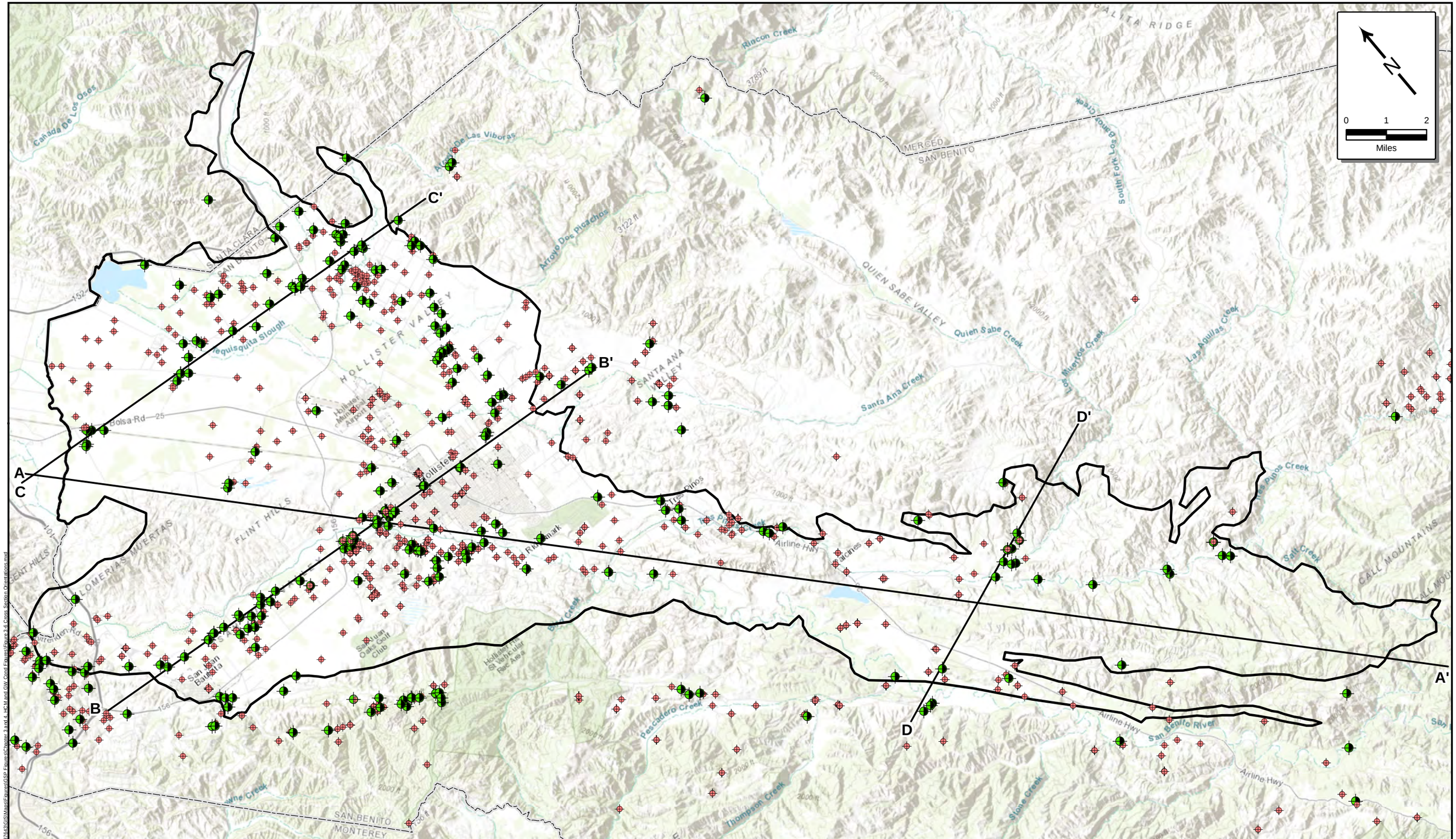
Figure 3-5
Surficial Geology



Well with Digitized Lithology and Construction Information

Well with Digitized Lithology Information

Well without Digitized Information

Cross Section Line Orientation

North San Benito Basin

San Benito County

November 2021

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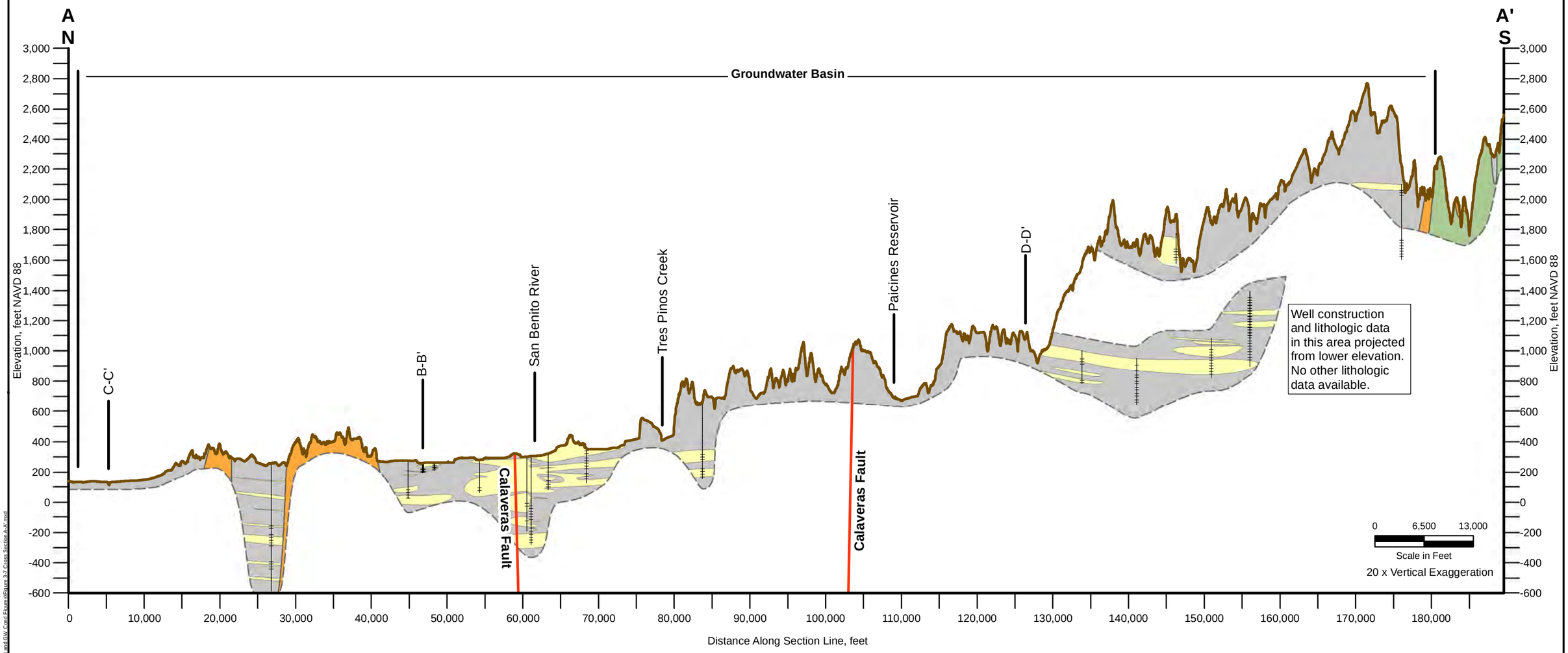
Figure 3-6
Cross Section Line Orientations



Notes:
Cross section only extended to depth of available information.

NAVD 88: North American Vertical Datum of 1988.

Well Screen
Total Drilled Borehole Depth
Fault

Sand and Gravel
Silt and Clay
Puc - Unnamed Pliocene continental mudstone
Ebu - Unnamed Eocene sedimentary rocks

Kp - Panoche Formation
Kgr - Granitic rocks
KJf - Franciscan Complex
Kgd - Granodiorite

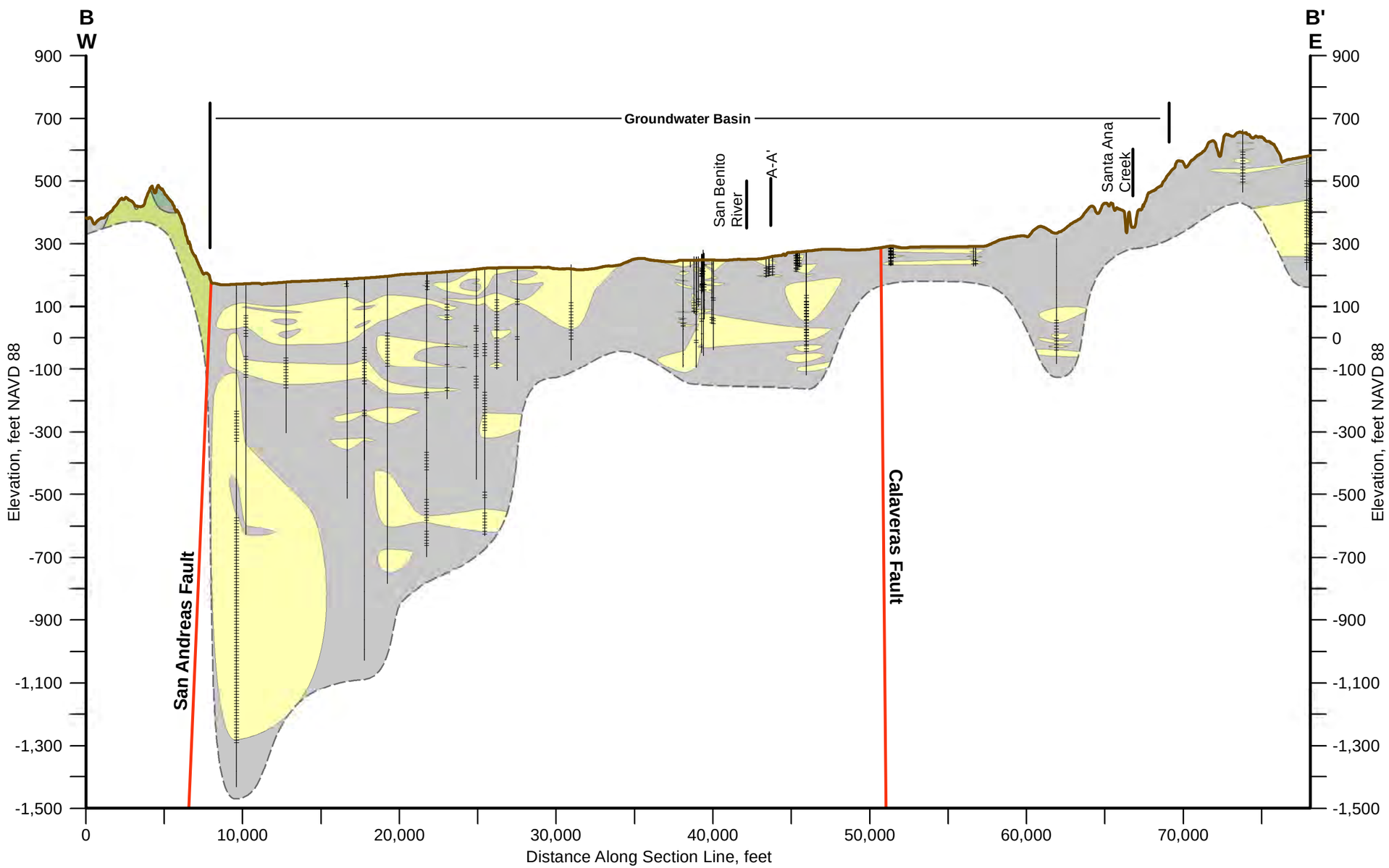
Jhg - Hornblende Gabbro of Logan quarry
Undifferentiated Bedrock
No Information

November 2021

TODD GROUNDWATER

Figure 3-7
Cross Section A to A'

Path: H:\Projects\San Benito GSP_7764\GIS\Maps\Figures\GSP Figures\Chapter 3 and 4 HCM and GW Cond Figures\Figure 3-7 Cross Section A-A.mxd



0 3,500 7,000
Scale in Feet
20 x Vertical Exaggeration

Notes:
Cross section only extended to depth of available information.

NAVD 88: North American Vertical Datum of 1988.

Well Screen
Total Drilled Borehole Depth
Fault

Sand and Gravel
Silt and Clay
Puc - Unnamed Pliocene continental mudstone
Ebu - Unnamed Eocene sedimentary rocks

Kp - Panoche Formation
Kgr - Granitic rocks
KJf - Franciscan Complex
Kgd - Granodiorite

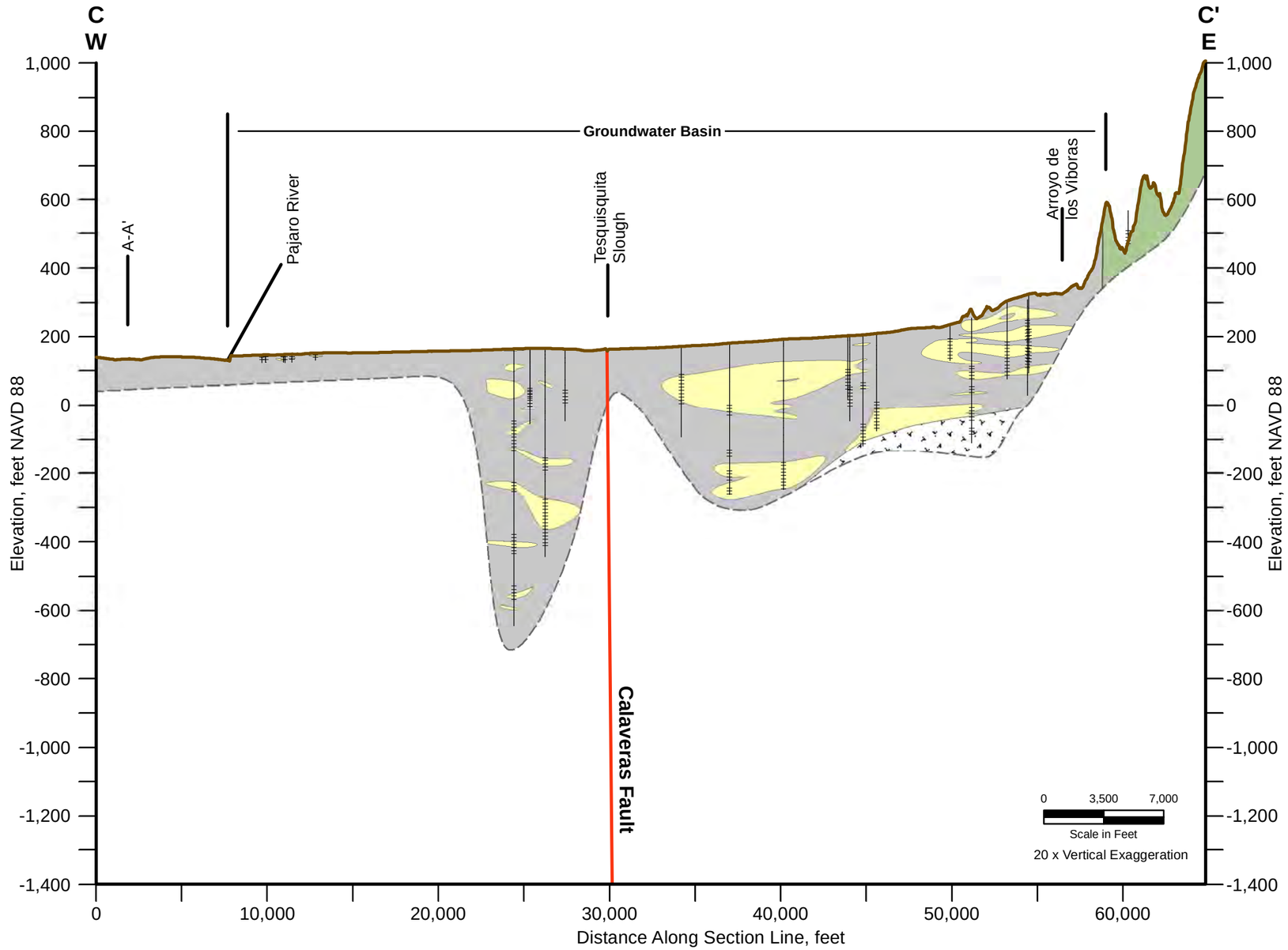
Jhg - Hornblende Gabbro of Logan quarry
Undifferentiated Bedrock
No Information

November 2021

TODD GROUNDWATER

Figure 3-8
Cross Section B to B'

Path: P:\Projects\San Benito PSG 2764\GIS\Maps\Figures\GSP Figures\Chapter 3 and 4 HCM and GW Cond Figures\Figure 3-8 Cross Section B-B'.mxd



Notes:
Cross section only extended to depth of available information.

NAVD 88: North American Vertical Datum of 1988.

Well Screen
Total Drilled Borehole Depth
Fault

Sand and Gravel
Silt and Clay
Puc - Unnamed Pliocene continental mudstone
Ebu - Unnamed Eocene sedimentary rocks

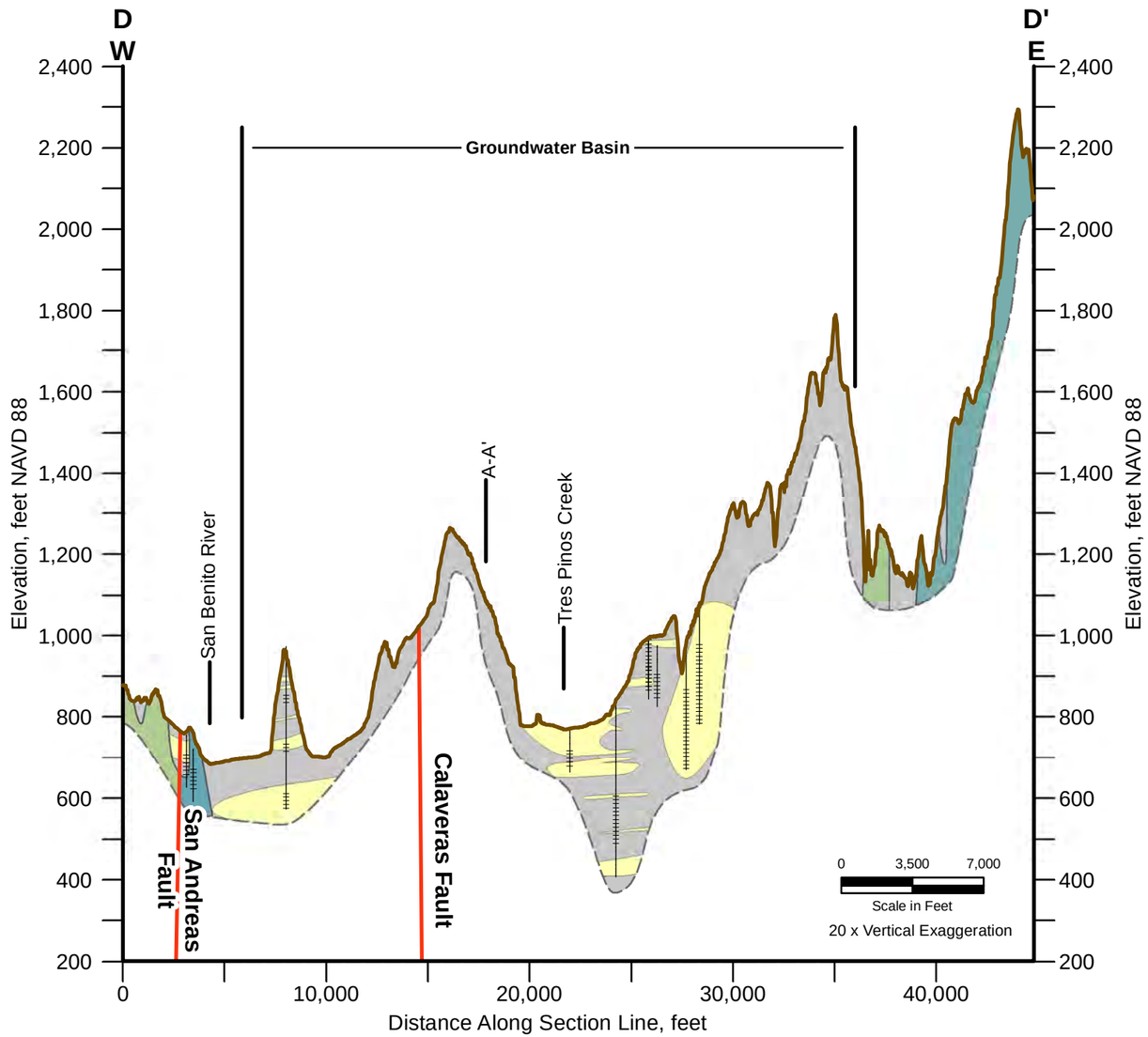
Kp - Panoche Formation
Kgr - Granitic rocks
KJf - Franciscan Complex
Kgd - Granodiorite

Jhg - Hornblende Gabbro of Logan quarry
Undifferentiated Bedrock
No Information

November 2021

TODD GROUNDWATER

Figure 3-9
Cross Section C to C'



Notes:
Cross section only extended to depth of available information.

NAVD 88: North American Vertical Datum of 1988.

Well Screen
Total Drilled Borehole Depth
Fault

Sand and Gravel
Silt and Clay
Puc - Unnamed Pliocene continental mudstone
Ebu - Unnamed Eocene sedimentary rocks

Kp - Panoche Formation
Kgr - Granitic rocks
KJf - Franciscan Complex
Kgd - Granodiorite

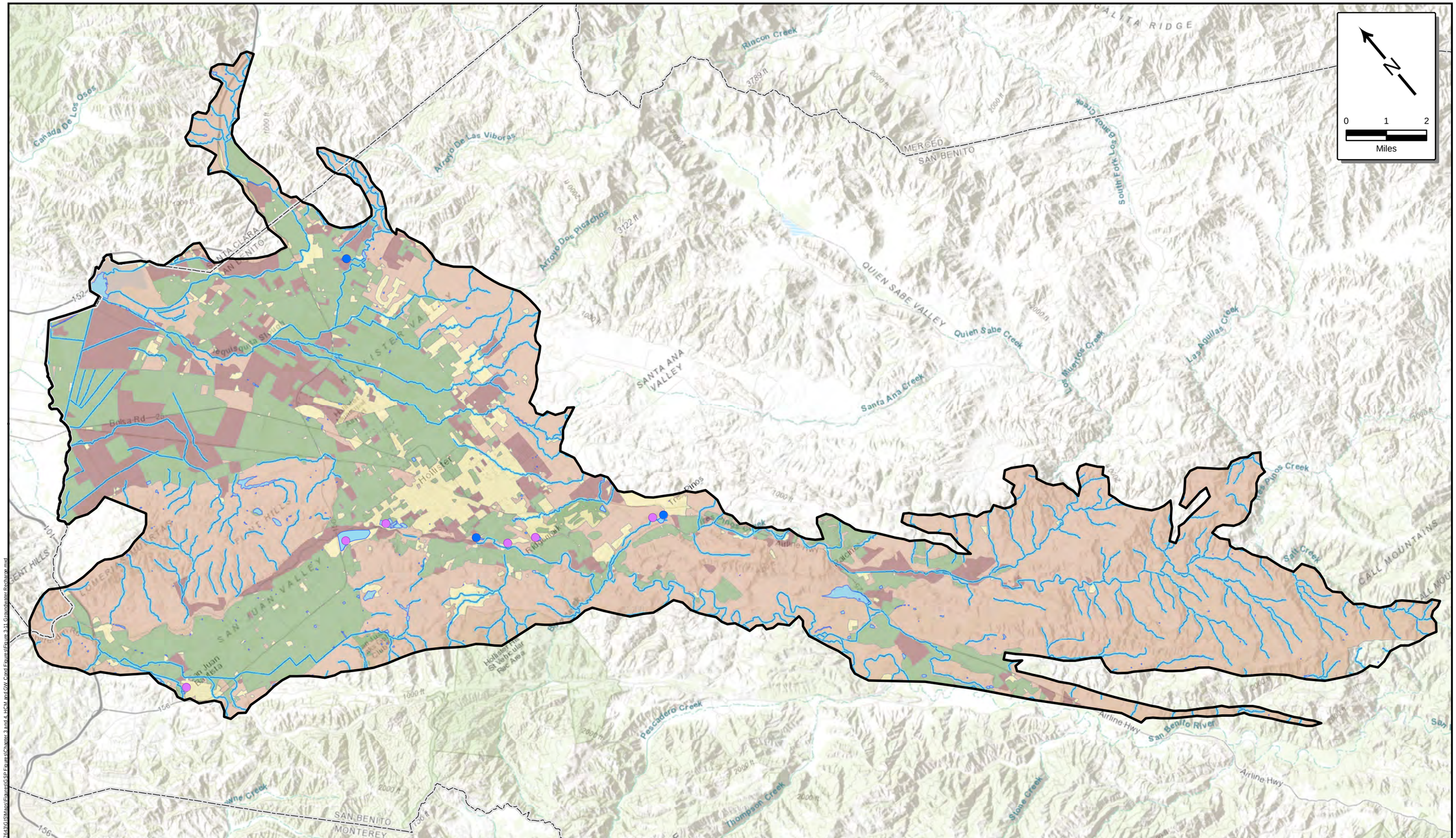
Jhg - Hornblende Gabbro of Logan quarry
Undifferentiated Bedrock
No Information

November 2021

TODD GROUNDWATER

Figure 3-10
Cross Section D to D'

Path: P:\Projects\San Benito GSP - 2764\GIS\Maps\Figures\GSP Figures\Chapter 3 and 4, HCM and GW Cond Figures\Figure 3-10 Cross Section D-D' .mxd



Note:
Groundwater discharge from the Basin occurs as discharge to streams, subsurface outflow, and groundwater pumping from wells. The distribution of active wells changes over time, so wells are not shown on this map.

November 2021

TODD GROUNDWATER

Figure 3-11
Groundwater Recharge and Discharge

4. CURRENT AND HISTORICAL GROUNDWATER CONDITIONS

This section describes the current and historical groundwater conditions in the North San Benito Basin (Basin). The Sustainable Groundwater Management Act (SGMA) requires definition of various study periods for current, historical, and projected future conditions. Current conditions, by SGMA definition, include those occurring after January 1, 2015, and accordingly, historical conditions occurred before that date. A historical period must include at least 10 years. For the North San Benito Basin, which has been actively monitored and managed for decades, the development and application of the numerical groundwater flow model has been central to San Benito County Water District (SBCWD) management. The study period for the numerical model begins in water year 1975 and extends through water year 2017. This period is representative and includes droughts and wet periods, with an average annual rainfall of 12.97 inches, comparable to the long-term average of 12.9 inches (1875 to 2017). Accordingly, groundwater conditions over time are described through 2017.

Groundwater conditions are described in terms of the six sustainability indicators identified in SGMA; these include:

- Groundwater elevations
- Groundwater storage
- Land subsidence
- Groundwater quality
- Seawater intrusion (which is not likely to occur in this inland basin)
- Interconnected surface water and groundwater dependent ecosystems.

4.1. GROUNDWATER ELEVATIONS

4.1.1. Available Data

The evaluation of groundwater elevations in the Basin was conducted using groundwater elevation data obtained from several sources, including the California Department of Water Resources (DWR) Water Data Library which includes California Statewide Groundwater Elevation Monitoring (CASGEM) data, SBCWD, U.S. Geological Survey (USGS), and Valley Water. The Data Management System (DMS) contains groundwater elevation data for 254 wells from 1924 to 2018. These wells are shown on **Figure 4-1**.

4.1.2. Groundwater Occurrence

As summarized in Section 3, groundwater is present in principal and secondary aquifers that generally are not distinguished in the Basin, because of sparse lithologic log data and a lack of distinctive textures and composition to differentiate the hydrostratigraphy. Groundwater in Basin aquifers occurs under unconfined to confined conditions, and areas with artesian flowing wells have been mapped; however, insufficient data are available to define vertical zones and to provide zone-specific groundwater elevation hydrographs and maps.

4.1.3. Groundwater Elevations and Trends

Hydrographs show groundwater elevation trends over time and were prepared for all 254 wells with elevation data; these hydrographs then were reviewed to identify representative wells. The selection of representative wells was based a quantitative approach that considered hydrographs with long records characteristic of an area and distribution of wells across the Basin. In brief, all available groundwater elevation data were plotted as hydrographs and well locations were plotted on a basin-scale map. Each well was rated (low-5, medium-10, and high-15) for the following criteria:

- Location – Wells were prioritized considering broad distribution across the Basin (including potential Management Areas), availability of other wells nearby, relationship to structures (e.g. faults) affecting groundwater described in the hydrogeologic conceptual model, and location near active recharge or discharge areas.
- Ongoing/Recent monitoring – Wells were selected that are part of the active monitoring network or have recent data.
- Historical – Wells were evaluated with consideration of length of monitoring record. Wells with data before 1977 were given a high rating; wells with data only in the last five years were rated low.
- Trends – Each hydrograph was assessed for continuity of monitoring, representation of local or regional trends, and presence of outliers or unrealistic data.

The top scoring wells are shown in **Figure 4-2**. These wells are representative of local groundwater elevation conditions and are appropriate for inclusion in the Groundwater Sustainability Plan (GSP) groundwater elevation monitoring network with well-by-well definition of sustainability criteria (such as undesirable results, minimum thresholds, management objectives). With GSP development and implementation, the network of such key wells will likely need to be revised, for example to add new wells for specific purposes (shallow monitoring) or to remove wells that are not actively monitored.

Long term changes in groundwater elevations in the Basin are illustrated in these representative hydrographs (**Figures 4-3** through **4-7**). Over time, groundwater elevations have varied in response to varying precipitation, groundwater pumping, importation of water, and managed aquifer recharge programs. **Figure 4-3** shows a long-term hydrograph with a record extending back to 1935. The hydrographs in **Figures 4-4** through **4-7** show conditions since January 1975 and thus encompass the GSP study period beginning in 1976. The hydrographs are presented by recognized areas -Bolsa, Hollister, San Juan, and Southern Management Areas (MAs) to better illustrate regional responses to drought conditions and to management activities led by SBCWD.

As a matter of historical overview, groundwater elevations are estimated to have been at historical highs prior to 1913 before intensification of groundwater pumping. In many wells, historical lows occurred because of pumping coupled with the drought conditions of the late 1970s; groundwater elevations in Hollister Valley declined more than 160 feet from the estimated highs (Kilburn, 1972).

Figure 4-3 is the long-term hydrograph for a well in Hollister MA (Well 11-5-35G1, see **Figure 4-2** for location) with drought periods and other important dates highlighted. Droughts were identified using a three-year moving average of annual precipitation less than 80 percent.

As shown in **Figure 4-3**, groundwater elevations at this well generally decreased from the 1940s to the 1970s reflecting increased groundwater production and a state of overdraft. Responses to drought

involved short-term declines of 30 feet or more with a decline of 50 feet in response to the extreme 1976 to 1977 drought. At that time, the Basin relied solely on groundwater (albeit recharged from local reservoirs) and groundwater elevations reached the historical low. In 1987, SBCWD began importation of Central Valley Project (CVP) water and groundwater elevations subsequently began to rise in the Hollister and San Juan valleys. Elevations also increased in Bolsa, although that area does not directly receive CVP water. A multiple year drought from 1988 through 1992 slowed the recovery of groundwater elevations because of reduced CVP imports and reduced recharge from rainfall and surface water. Following that drought, CVP imports increased, allowing reduction of groundwater pumping and recovery of groundwater elevations due to "in lieu" recharge. In addition, from 1994 to 2004, managed recharge of CVP water along stream channels (e.g., San Benito River) ranged from 1,000 AFY to over 11,000 AFY, with a total recharge volume exceeding 40,000 AF over the 11-year period. The result of in lieu and SBCWD managed aquifer recharge (MAR) programs was significant recovery. This is shown in **Figure 4-3** and occurred most notably in the Hollister and San Juan valleys where imported water is delivered, with some recovery also in Bolsa and areas south of Paicines.

With groundwater elevation recovery, SBCWD shifted its MAR program from recovery to maintenance and local management of groundwater elevations. For example, in response to the latest multiple year drought (2012 through 2015) groundwater elevations declined broadly across the Basin; this was not unexpected but reflected conjunctive management of surface water and groundwater supplies, with use of groundwater storage during drought with long term planning to replenish that storage in wet years. As illustrated in **Figure 4-3**, with the end of drought in 2016 and increased imported water allocations, groundwater elevations have recovered. Recovery occurred in most areas of the Basin over 2016 and 2017.

Given the history of the basin, recovery can be accelerated with targeted management actions in the areas with the most need, given availability of replenishment water (for in lieu or MAR) and, where MAR is practiced, accessibility to recharge sites. While the broad trends are similar across the basin, each region shows unique groundwater trends.

Figure 4-4 shows key hydrographs for the Bolsa region, which is predominantly agricultural and depends solely on groundwater pumping. Locally confined conditions in the northeast along Pacheco Creek result in artesian wells, wells with groundwater elevations above the ground surface. Groundwater elevations for wells 11-5-21E2 and 11-5-28B1 show fluctuating groundwater elevations before about 1995, reflecting responses to and recovery from droughts in the 1970s and 1980s. In recent years, elevations have risen to above ground surface with artesian conditions. Because there is no mechanism at these wells to measure elevations above ground surface, the hydrographs show elevations equal to the ground surface. Both wells (likely agricultural irrigation wells) show a strong seasonal pattern before about 1995. To the south, groundwater elevations in well 12-5-06L1 show a gradual increasing trend since 1975 and well 12-5-17D1 shows a gradual decreasing trend. The different trends in these wells, located within two miles from each other, likely reflect changing land use and pumping patterns. For example, well 12-5-17D1 with a decreasing trend may be in an area with increasing groundwater pumping. Both wells (likely irrigation wells) show a significant seasonal pattern.

Figure 4-5 shows representative hydrographs for the Hollister Valley, which encompasses diverse conditions in terms of water supply and recharge, land use and water demand, and groundwater management. The artesian well zone in the northeast Bolsa extends into the northwest Hollister Valley. The hydrograph for well 12-5-03B1 shows the similar signature with groundwater elevation fluctuations until the 1990s with groundwater elevations recovering to and remaining at ground surface elevations,

as potential higher elevations are not recorded. The hydrograph for well 11-5-13D1, along the upper Pacheco Creek, is characterized by groundwater elevations that have remained steady with 2017 groundwater elevations near historical highs. This pattern likely reflects recharge from the creek and limited local pumping. Well 12-5-24N1 shows a substantial recovery of groundwater elevations from the historical lows of the late 1970s, which were near mean sea level at this well. Groundwater elevations slowly increased by 180 feet, reflecting the availability of CVP supply and reduced local pumping. The hydrograph for well 12-5-34P1, located near the San Benito River in the southern valley, shows fluctuations reflecting drought declines and recovery. In this well, groundwater elevations were at historical lows during the early 1990s and increased quickly by 90 feet within three years; the rapidity of recovery in this well likely reflects SBCWD managed aquifer recharge along the river.

Figure 4-6 shows hydrographs of selected wells in the San Juan MA. San Juan MA is characterized by agriculture supplied with groundwater and CVP water (since 1987) and by recharge activities along the San Benito River. The hydrograph for well 12-4-26G1 shows the typical fluctuations in the 1970s and 1980s, reflecting responses to and recovery from droughts. In the 1990s, the hydrograph shows a steep rise in groundwater elevations, more than 80 feet in five years. This reflects not only the effect of in lieu recharge due to CVP importation, but also rapid filling of available groundwater storage space with natural recharge and managed aquifer recharge along the San Benito River. Well 12-4-17L20 is located further downstream near the outlet of the Basin. The hydrograph shows a slight recovery over the same period in the 1990s; relative to well 12-4-26G1, the effect is muted because groundwater elevations already were near ground surface and there was no available groundwater storage capacity. The remaining hydrographs, for three wells arrayed along the southern valley, generally do not meet the selection criteria for representative wells in terms of having long, complete records that extend to the present. Despite the obvious deficiencies, these three hydrographs are the best available in this portion of the Basin and will need to suffice until a suitably long, complete, and current monitoring is developed.

Figure 4-7 shows representative hydrographs for wells in the Southern MA. Unlike the other hydrographs within elevations of 0 to 300 feet msl, these elevations range from 750 feet msl (in the Wildlife Center 5 well) in the south to around 400 feet (in well 13-6-19K1) near the confluence of the Tres Pinos Creek and San Benito River. The gradient reflects the topography of the Basin (see Cross section A to A' on **Figure 3-7**) as well as the strong northern gradient and flow direction.

Review of **Figure 4-7** indicates generally slight but widespread groundwater declines. The longest hydrograph is for well 13-6-19K1 near the confluence of Tres Pinos Creek and the San Benito River, which shows a decline of about 20 feet during the most recent drought. Hydrographs for the two wells along Tres Pinos Creek south of Paicines also show a decrease in groundwater elevations during the most recent drought and a modest recovery in recent years. The Wildlife Center 5 well experienced a decline of 40 feet and the Donati 2 well indicates a decline of 15 feet. The Schields 4 well located along the San Benito River Valley shows a decline of about 20 feet.

4.1.4. Groundwater Flow

Figures 4-8 and **4-9** are groundwater elevation contour maps constructed to examine current groundwater flow conditions using data from 2017. Contours were developed based on available groundwater elevation data for all wells.

For the purposes of this discussion, the contours were not prepared assuming local faults (most notably the Calaveras Fault) as groundwater barriers. The Calaveras Fault and others probably provide some

impedance to groundwater flow; however, this effect is likely to vary over the length of the fault and with depth (and relative groundwater elevations). The numerical groundwater flow model has examined these non-linear impacts over a variety of flow conditions through calibration. More information is provided in the numerical model documentation report, Groundwater Model Update and Enhancement 2020 Report, included in **Appendix G**.

Figures 4-8 and **4-9** show groundwater contours for Spring 2017 and Fall 2017, respectively. The spring groundwater elevation map reflects seasonal highs, while the fall map reflects seasonal lows. By way of comparison, groundwater elevations in wells typically fluctuate 5 to 15 feet on a seasonal basis (**Figure 4-5**, for example) except in the Bolsa MA (**Figure 4-4**) where groundwater elevations may have seasonal fluctuations of 30 to 40 feet (Yates, 2003).

Groundwater flow generally parallels the major surface streams from the southeast and eastern portions of the Basin toward the northwestern portions and the Pajaro River. In the Bolsa MA, groundwater flow converges into areas of low groundwater elevations (indicated by closed contours such as the 100-foot contour) that are caused by groundwater pumping.

For a historical perspective, **Figure 4-10** shows the groundwater contour map from 1968 (Kilburn, 1972), prior to importation of CVP water. Relative to **Figures 4-8** and **4-9**, the 1968 map presents different basin boundaries and different interpretations of fault and geologic effects on groundwater elevations and flow. Nonetheless the 1968 map shows effects on areal groundwater elevations and flow during a period of intense groundwater pumping without imported water. As shown, in 1968 the Basin was characterized by groundwater elevation depressions not only in the Bolsa MA, but also in the Hollister and San Juan MAs; these are indicated by closed 60- and 80-foot contours with hachures. Comparison of **Figure 4-10** and **Figures 4-8** and **4-9** indicate that the groundwater depressions in Hollister and San Juan MAs have filled and general northward groundwater flow has resumed.

4.1.5. Vertical Groundwater Gradients

The current monitoring network for groundwater elevations provides little information about vertical head (groundwater elevation) gradients within the Basin. Available data are almost entirely from water supply wells, which are typically screened between 200 and 500 ft-bgs. The potentiometric head at the depth of the well screen can be different from the true water table, which is the first zone of saturation reached when drilling down from the ground surface. This was documented in a study of shallow groundwater conditions in the San Juan Valley (Yates et al., 1999). At that time, downward head gradients in several shallow-deep well pairs were in the range of 0.10 to 0.80. The maximum value for fully saturated conditions is 1.00. Larger gradients indicate that there is an unsaturated zone between the shallow well screen and the deep well screen. The study noted that when deep groundwater elevations were tens of feet lower in prior decades, shallow zones of saturation were probably hydraulically disconnected from deep aquifers and therefore unaffected by deep pumping.

Flowing wells discharge at the ground surface without the aid of a pump and are an indication of upward vertical head gradients between the depth of the well screen and the ground surface. When regional groundwater elevations recovered in the late 1990s, wells began flowing in two areas where flowing wells had been reported under near-predevelopment conditions (Clark, 1924): along Lovers Lane and Shore Road south of Pacheco Creek and in the vicinity of Prescott Lane northwest of San Juan Bautista. Although the vertical gradient at these wells is certainly upward, it has not been quantified.

Vertical head gradients are an important factor affecting the viability of riparian vegetation. As discussed in greater detail in Section 4.11.3, Riparian Vegetation, phreatophytic vegetation along streams generally survives droughts even when groundwater elevations in wells are tens of feet below the ground surface for two or more years. This suggests that some shallow zones of saturation persist even when head in deep aquifers declines. This implies the presence of large vertical head gradients within the aquifer system.

4.2. Changes In Groundwater Storage

SBCWD provides conjunctive use of groundwater and surface water sources, involving use of groundwater in storage when surface water supplies are diminished and replenishment of groundwater storage when surface water supplies are available. Accordingly, groundwater storage is characterized by changes in the short term but has been stabilized for much of the Basin for the long term, given availability of CVP supply since 1987.

SBCWD Annual Groundwater Reports (**Appendix F**) historically have assessed annual changes in groundwater storage; this has been intended to detect overdraft and, if overdraft were to occur, to track accumulated overdraft as a basis for sustainability planning. This assessment has been based on autumn to autumn comparisons of groundwater elevations (while GSP Regulations require spring to spring) and has been focused on Zone 6 and adjacent areas and thus has not addressed the entire North San Benito Basin. Nevertheless, the previous reports provided insight into groundwater storage change patterns and were an important groundwater management tool.

These storage changes were estimated based on available groundwater elevation data that are limited geographically and temporally and thus include uncertainty. In addition, the change calculations used estimated storativity (or storage coefficient, the volume of water released from storage per unit decline in hydraulic head), which is largely unknown across the Basin. In this method, the volume of groundwater storage change for a time period is calculated by multiplying the average groundwater elevation change in an area over that period by the estimated storage coefficient for the area.

Annual groundwater storage changes have also been estimated through analytical water budgets. These analytical water budgets have estimated all the inflows and outflows to the Basin, with the change in storage as the residual (inflow – outflow = change in storage). However, this method cannot account for dynamic subsurface flow conditions that result in groundwater flow into and out of the Basin, and they generally result in larger change in storage estimates than those in the water level method described above.

Both the water level and water budget methods for estimating periodic changes in storage have uncertainty associated with inherent limitations. Annual and cumulative change in groundwater storage estimates for the entire Basin have been prepared for this GSP using the numerical model. These estimates are presented in Section 5, Water Budget. The numerical model will also be used for estimating annual changes in storage in future annual reports and periodic GSP updates.

4.3. Land Subsidence and Potential for Subsidence

Land subsidence is the differential lowering of the ground surface, which can damage structures and facilities. This may be caused by regional tectonism or by declines in groundwater elevations due to

pumping. The latter process is relevant to the GSP. In brief, as groundwater elevations decline in the subsurface, predominantly fine-grained deposits (such as clay and silt) can become compacted, causing the overlying ground surface to subside.

This process is illustrated by two conceptual diagrams shown on **Figure 4-11**. The upper diagram depicts an alluvial groundwater basin with a regional clay layer and numerous smaller discontinuous clay layers. Groundwater elevation declines associated with pumping cause a decrease in water pressure in the pore space (pore pressure) of the aquifer system. Because the water pressure in the pores helps support the weight of the overlying aquifer, the pore pressure decrease causes more weight of the overlying aquifer to be transferred to the grains within the structure of the sediment layer. If the weight borne by the sediment grains exceeds the structural strength of the sediment layer, then the aquifer system begins to deform. This deformation consists of re-arrangement and compaction of fine-grained units[2], as illustrated on the lower diagram of **Figure 4-11**. The tabular nature of the fine-grained sediments allows for preferred alignment and compaction. As the sediments compact, the ground surface can sink, as illustrated by the right-hand column on the lower diagram of **Figure 4-11**.

Land subsidence due to groundwater withdrawals can be temporary (elastic) or permanent (inelastic). Elastic deformation occurs when sediments compress as pore pressures decrease but expand by an equal amount as pore pressures increase. A decrease in groundwater elevations from groundwater pumping causes a small elastic compaction in both coarse- and fine-grained sediments; however, this compaction recovers as the effective stress returns to its initial value. Because elastic deformation is relatively minor and fully recoverable, it is not considered an impact.

4.3.1. Inelastic Deformation

Inelastic deformation occurs when the magnitude of the greatest pressure that has acted on the clay layer since its deposition (preconsolidation stress) is exceeded. This occurs when groundwater elevations in the aquifer reach a historically low groundwater elevation. During inelastic deformation, or compaction, the sediment grains rearrange into a tighter configuration as pore pressures are reduced. This causes the volume of the sediment layer to reduce, which causes the land surface to subside. Inelastic deformation is permanent because it does not recover as pore pressures increase. Clay particles are often planar in form and more subject to permanent realignment (and inelastic subsidence). In general, coarse-grained deposits (e.g., sand and gravels) have sufficient intergranular strength and do not undergo inelastic deformation within the range of pore pressure changes encountered from groundwater pumping.

The volume of compaction is equal to the volume of groundwater that is expelled from the pore space, resulting in a loss of storage capacity. This loss of storage capacity is permanent but may not be substantial because clay layers do not typically store significant amounts of usable groundwater (LSCE, et al. 2014). Inelastic compaction, however, may decrease the vertical permeability of the clay resulting in minor changes in vertical flow.

[2] Although extraction of groundwater by pumping wells causes a more complex deformation of the aquifer system than discussed herein, the simplistic concept of vertical compaction is often used to illustrate the land subsidence process (LSCE et al. 2014).

The following potential impacts can be associated with land subsidence due to groundwater withdrawals (modified from LSCE, et al. 2014):

- Damage to infrastructure including foundations, roads, bridges, or pipelines;
- Loss of conveyance in canals, streams, or channels;
- Diminished effectiveness of levees;
- Collapsed or damaged well casings; and
- Land fissures.

Inelastic subsidence has not been a known issue in the Basin. Nonetheless, its potential was recognized in the 2003 Groundwater Management Plan (Kennedy/Jenks, 2003), which established a specific water quantity criterion to manage groundwater elevations, to maintain groundwater storage, and to limit drawdown to historical low levels of about 1977 to preclude and/or minimize the potential for ground settlement (i.e., inelastic land subsidence). SBCWD management of groundwater elevations generally has been successful in meeting these objectives, except for local declines at the end of the 2012 to 2014 drought, and there have been no reports of subsidence problems.

Direct measurements of subsidence have not been made in the Basin using specialized equipment (e.g., extensometers) or using repeated measurement of benchmarks. However, two sources of subsidence data are available: interferometric synthetic aperture radar (InSAR) data that provide spatial coverage using radar images from satellites and data from University Navigation Satellite Timing and Ranging System Consortium (UNAVCO) (UNAVCO, 2021), which provides temporal land elevation measurements from thousands of globally distributed permanent stations.

4.3.2. Interferometric Synthetic Aperture Radar (InSAR)

InSAR data provided by California Department of Water Resources (DWR) on its SGMA Data Viewer (DWR 2019b) provide information on vertical displacement of the land surface across a broad area of California from May 31, 2015 to April 30, 2017; this represents current conditions as defined in this GSP. The InSAR mapping area extended across the central San Joaquin Valley and included portions of the Paso Robles Basin, Salinas Valley, and entire North San Benito Basin. **Figure 4-12** shows the mapping within the North San Benito Basin. Subsidence, measured in inches, is depicted with darker gray tones indicating land subsidence as much as six inches over the two years while lighter tones indicate land rise of up to four inches. Most of the Basin is characterized by no change to small decline (0 to -2 inches) with some areas of land rise (as much as 4 inches) mostly along basin margins and some scattered areas of decline as much as 6 inches. While no subsidence problems have been reported, the general distribution of the scattered areas of decline indicate a relationship to local groundwater pumping.

4.3.3. University Navigation Satellite Timing and Ranging System Consortium (UNAVCO)

Data are available from UNAVCO from numerous stations in San Benito County (reflecting its position along the San Andreas Fault, a major tectonic plate boundary), including eight within or near the Basin, **Figure 4-13**. The locations are shown in the inset map on **Figure 4-14** and the data are shown in the graphs as cumulative displacement (change) in inches. Seven of the eight graphs are similar and show short-term elastic variability (on the order of days) and long-term stability or upward movement that is likely tectonic. The graph for Station P242 in the Bolsa area is distinct, showing short-term variability, seasonal changes of generally two inches, and a long-term declining trend. This trend and the proximity of this station to InSAR mapped areas of land surface decline suggest inelastic subsidence related to

local groundwater pumping. However, the UNAVCO data, which represent measured vertical displacement, indicate cumulative changes generally less than two inches, while the InSAR mapping suggests greater displacement over shorter periods. When additional InSAR mapping is available, spanning a longer period, detailed comparison of UNAVCO and InSAR data will be warranted.

4.4. Groundwater Quality Issues

The natural quality (chemistry) of groundwater is generally controlled by the interaction between rain water and rocks/soil of the vadose zone and aquifers (Drever, 1988). As rainfall infiltrates through the soil column, changes in water chemistry occur as anions and cations are dissolved into the water. These changes are influenced by soil and rock types, weathering, organic matter, and geochemical processes occurring in the subsurface. Once in the groundwater system, changing geochemical environments continue to alter groundwater quality. A long contact time between the water and sediments may allow for more dissolution and more concentrated groundwater (Drever, 1988). The natural groundwater quality in a basin is the net result of these complex subsurface processes that have occurred over time.

The quality of groundwater in the Basin has been described as highly mineralized and of marginal water quality for drinking and agricultural purposes. The mineralized water quality is typical of other relatively small Coast Range groundwater basins and reflects the geologic formations in the Central Coast watersheds (e.g., marine sediments) and the relatively low permeability of groundwater basin sediments, which leads to long contact time with groundwater.

Groundwater in the Basin has also been impacted by human activities including agricultural, urban, and industrial land uses. State agencies with regulatory oversight for water quality in the Basin include the Central Coast Regional Water Quality Control Board (RWQCB) and the State Water Resources Control Board – Division of Drinking Water (DDW).

4.4.1. Monitoring Networks

SBCWD currently monitors a distributed network of 18 wells for water quality, shown in **Figure 4-15**. The SBCWD maintains a comprehensive water quality database, created in 2004 (Todd, 2004) with a State Local Groundwater Assistance Grant and updated every three years. The database has been regularly updated with readily available data from the SBCWD, Regional Water Quality Control Board, California State Water Resources Control Board, Tres Pinos Water District, City of Hollister, and SSCWD. Updates have been presented on a triennial basis in SBCWD Annual Groundwater Reports (e.g., Todd 2007, 2010, 2013b, 2016 and 2019). The database contains more than one million records from more than 170 water systems or regulated facilities and over 2,000 monitoring locations in the North San Benito Basin including data from Santa Clara County portions of the Basin.

The RWQCB regulates discharges from irrigated agricultural lands to protect surface water and groundwater, using a permit called a Conditional Waiver of Waste Discharge Requirements that applies to owners and operators of irrigated land used for commercial crop production. The RWQCB is focusing on priority water quality issues, such as pesticides and toxicity, nutrients, and sediments, especially nitrate impacts to drinking water sources.

San Benito landowners belong to the Central Coast Groundwater Coalition. Together with landowners in Salinas Valley, Pajaro Valley, and Llagas Subbasin, they collect water quality data and have prepared a report, *Northern Counties Groundwater Characterization* (LSCE 2015). The report summarizes nitrate

concentrations from 1,105 wells in the Gilroy-Hollister Valley (including the Hollister and San Juan Valleys and the Bolsa area in the Basin). Data for the Irrigated Lands Program will be included in the SBCWD Water Quality Database for annual GSP reports.

There are 110 drinking water systems, with a total of 320 well locations in the San Benito County portion of the Basin and 2 systems with a total of 4 well locations in the Santa Clara County portion of the Basin. These stations report water quality data to the DDW. Each system monitors and reports water quality parameters to DDW and is required to participate in the Drinking Water Source Water Assessment Program (DWSAP) to assure wells are not subject to local contamination. **Figure 4-16** shows the approximate location of drinking water systems in the Basin.

4.5. Other Studies

4.5.1. Salt and Nutrient Management Plan

Consistent with the 2013 SWRCB Recycled Water Policy, a Salt and Nutrient Management Plan (SNMP) was developed for the San Benito County portion of the Basin in 2014[3] (Todd, 2014). The purpose of the SNMP is to identify sources of salts and nutrients (current and future) as context for assessing potential impacts of recycled water projects and to plan for management of salt and nutrient sources to ensure that groundwater is safe for drinking and all other beneficial uses. Beneficial uses of water and respective water quality objectives are defined by the RWQCB in the Central Coast Water Quality Control Plan (Basin Plan).

The SBCWD SNMP analysis demonstrated that the recycled water irrigation projects planned through 2021 will use less than one percent of the available TDS and nitrate assimilative capacity, namely the difference between average salt and nutrient concentrations in the Basin and the respective Basin Plan objectives. Therefore, the recycled water irrigation projects satisfy Recycled Water Policy criteria. The SNMP analysis found that recycled water use can be increased while still protecting groundwater quality for beneficial uses.

Based on the analysis, the SNMP concluded no additional implementation measures are warranted beyond those that have been implemented and those that are already planned. Nonetheless, the SNMP management process is active and ongoing, and continued water quality monitoring will ascertain the effectiveness of implementation measures.

With respect to monitoring, the Recycled Water Policy states that the SNMP should include a monitoring program that consists of a network of monitoring locations "... adequate to provide a reasonable, cost-effective means of determining whether the concentrations of salts, nutrients, and other constituents of concern as identified in the salt and nutrient plans are consistent with applicable water quality objectives." Additionally, the SNMP is required to focus on basin water quality near water supply wells and areas proximate to large water recycling projects, particularly groundwater recharge projects (Todd, 2014).

[3] Santa Clara County areas of the Basin were not included in the nominal SNMP study area. Nonetheless, data are provided on maps, including available land use and water quality data. No recycled water projects have been planned for these areas.

The SNMP Monitoring Plan laid out a program wherein the data collected and compiled by the SBCWD are analyzed and reported to the RWQCB every three years as part of the SBCWD Groundwater Report. The analyses include time concentration plots, water quality concentration maps, and more.

4.6. Threats to Water Quality

4.6.1. Regulated Facilities

The RWQCB has regulated more than 123 facilities with soil and groundwater contamination in the Basin (119 in San Benito and 4 in Santa Clara County). Of those, 45 sites are active in (or adjacent to) the Basin (44 in San Benito and 1 in Santa Clara County). The active and inactive sites are shown on **Figure 4-17**. Data for 892 wells monitored by these facilities are currently included in the SBCWD Water Quality database and will continue to be included in the updates. These facilities range from large-scale soil and groundwater clean-up operations to leaking underground storage tanks. RWQCB files for such regulated facilities have been and will continue to be checked regularly as part of the SBCWD water quality monitoring program.

4.6.2. Septic Systems

Most residences and businesses in unincorporated areas of the Basin rely on on-site wastewater treatment (OWTS or septic systems). These represent sources of salt and nutrient loading to groundwater, as well as potential sources of other contaminants. San Benito County Department of Environmental Health is the permitting agency for septic systems and wells in San Benito County. Similarly, the Santa Clara Department of Environmental Health is responsible for OWTS in the small Santa Clara portions of the Basin. The San Benito County Department of Environmental Health maintains an inventory of septic system installations from 1953 to the present, including address and/or assessor parcel number. While it is unclear how many of these septic systems are still operating, San Benito County has thousands of permits on file.

4.6.3. Oil and Gas

The Hollister Oil and Gas Field overlies parts of the Basin near the Bolsa and San Juan regions. The location, along with a 0.5-mile buffer is shown on **Figure 4-17**. Hydrocarbons exist approximately 600 feet below the base of fresh water and is not likely to impact drinking water. A San Benito County Fracking Ban Initiative ballot question was approved by voters in November 2014. This measure was designed to prohibit hydraulic fracturing, known as fracking, and related gas and oil extraction activities, as well as other “high-intensity petroleum operations,” including acid well stimulation and cyclic steam injection. It also banned any new gas or oil drilling activity including conventional, low-intensity activity in areas of the county zoned for residential or rural land use (Aspen, 2015).

4.6.4. Non-point Sources

Nonpoint Source (NPS) pollution is defined by the SWRCB as contamination that “does not originate from regulated point sources and comes from many diffuse sources.” NPS could occur when rainfall carries contaminants to surface water ways or percolates contaminants to groundwater. One example is loading to groundwater of nitrate from agricultural or landscaping land applications.

4.7. Key Constituents of Concern

Total dissolved solids (TDS) and nitrate are the indicator salts and nutrients and key constituents of concern (COCs) for the Basin. These constituents were selected based on feedback from groundwater users, available baseline data, impact to beneficial users, and basin objectives from other local agencies. TDS data are available for both inflows and outflows from the Basin. There is elevated natural background TDS concentrations in groundwater. This has been documented since the 1930s and has been ascribed to the subsurface sediments. In addition, TDS can be an indicator of anthropogenic impacts (e.g., infiltration of urban runoff, agricultural return flows, and wastewater disposal). The SNMP analysis of salt loading predicted stable or decreasing trends in TDS concentrations, with the exception of two areas (Bolsa and Tres Pinos Valley areas as defined in the SNMP at the time). Nitrate is the primary form of nitrogen detected in groundwater and natural nitrate levels in groundwater are generally very low. Elevated concentrations of nitrate in groundwater are associated with agricultural activities, septic systems, confined animal facilities, landscape fertilization, and wastewater treatment facility discharges. The maximum contaminant level (MCL) for nitrate (as nitrate, NO_3) is 45 milligrams per liter (mg/L). Nitrate data are available for basin inflows and outflows, and as documented in the SNMP (Todd, 2014), elevated nitrate concentrations have been a recognized, long-term concern in the Basin. The SNMP analysis of nitrate loading found that most areas had predicted small increasing trends in nitrate in groundwater.

Previous water quality studies have identified other constituents of concern including boron, chloride, hardness, metals, sulfate, and potassium (Todd, 2004). In some parts of the Basin, groundwater does not meet water quality standards for these constituents relative to the intended beneficial uses of the groundwater.

4.7.1. Water Quality Goals

The RWQCB has established General Basin Plan Objectives (GBPOs) for groundwater with municipal and domestic water supply and agricultural water supply beneficial uses in the Central Coast as shown in **Table 4-1** below. For TDS, the DDW has adopted Secondary Maximum Contaminant Levels (SMCLs); SMCLs address aesthetic issues related to taste, odor, or appearance of the water and are not related to health effects. The recommended SMCL for TDS is 500 mg/L with an upper recommended level of 1,000 mg/L, and a short-term limit of 1,500 mg/L. Elevated TDS concentrations can affect water supply suitability for irrigation uses; in general crop yields decrease above a threshold TDS value, which is crop-dependent.

The primary MCL for nitrate (as N) is 10 milligrams per liter (mg/L), or as expressed in this report, in terms of nitrate (as NO_3), the MCL is 45 mg/L. These MCLs are based on health concerns due to methemoglobinemia, or “blue baby syndrome”.

The SNMP also presented basin-specific plan objectives, as listed in **Table 4-2** below for the Hollister and Tres Pinos Subbasins (as previously defined by DWR). In addition, for the San Juan and Bolsa Subbasins, a TDS assimilative capacity benchmark of 1,200 mg/L was assigned. Ambient groundwater quality in the San Juan Bautista and Bolsa area is similar to or slightly poorer than in the Hollister area; thus, use of the same TDS objective for these subbasins is deemed reasonable. For nitrate- NO_3, a basin-specific plan objective of 22.5 mg/l was applied to Hollister Subbasin and an assimilative capacity benchmark of 45 mg/L) was applied to assimilative capacity calculations in the DWR San Juan Bautista and Bolsa Subbasins (Todd, 2014).

Table 4-1. General Basin Plan Objectives

Parameter	Units	Municipal	Agricultural
TDS	mg/L	500/1,000/1,500[1]	450
Nitrate (as NO_3)	mg/L	45	100[2]
Nitrate + Nitrite-N	mg/L	10	100 [2]

mg/L – milligrams per liter
1. Objectives for TDS are recommended SMCLs.
2. For livestock watering.

Table 4-2. Basin-Specific Basin Plan Objective

Parameter	Units	DWR Subbasin	
		Hollister	Tres Pinos
TDS	mg/L	1,200	1,000
Nitrate (as NO_3)	mg/L	22.5	22.5
Nitrogen (as N)	mg/L	5	5

4.7.2. Key Constituents in Groundwater

Table 4-3 shows current average concentrations for TDS and nitrate for the four Management Areas. The values were developed by averaging all drinking water and ambient monitoring events that occurred from water year 2015 to 2017; water quality samples from regulated facilities were not included in the analysis. These average conditions serve as a snapshot and allow a comparison of water quality conditions across the Basin.

Table 4-3. Average Constituent Concentrations by Area 2015-2017

Management Area	Nitrate (NO_3, mg/L)	Total Dissolved Solids (TDS, mg/L))
San Juan	37.1	1,806
Southern	39.4	895
Hollister	47.9	810
Bolsa	50.3	839

4.7.3. Total Dissolved Solids (TDS)

As documented in **Table 4-3**, TDS concentrations are generally high throughout the Basin and the average TDS concentrations exceed the secondary MCL for drinking water (500 mg/L).

The relatively high TDS concentrations are also indicated in **Figure 4-18**, which show TDS concentrations over time in selected wells across the Basin. While concentrations are high (e.g., exceeding 500 mg/L), recent years (2014 through 2017) are characterized by TDS concentrations that are stable or decreasing. For example, in the San Juan Valley, some wells downstream of the historical wastewater treatment ponds (e.g., MW47, see **Figure 4-15** for well location) show a general decrease in concentrations, possibly due to the reduced percolation of wastewater in recent years. However, water quality samples

in this area continue to have high TDS concentrations relative to the rest of the Basin; lowest TDS concentrations are indicated in well MW42, see **Figure 4-15** for well location (in the Bolsa area).

Figure 4-19 shows the average concentrations at selected water quality monitoring wells in the Basin that have been sampled in water years 2014 to 2017 for TDS; the well locations are shown in **Figure 4-15**. Generally, the eastern and northern edges of the Basin show lower concentrations of TDS. Higher TDS areas reflect geology (e.g., fault zones and older sediments) and historical wastewater disposal among other factors. In some areas, including the Bolsa, TDS concentrations vary over time, most likely due to a local sources and variability of groundwater conditions (i.e., changes in pumping resulting in changes to groundwater flow direction).

4.7.4. Nitrate as NO_3

As documented in **Table 4-3**, average nitrate conditions are high throughout the Basin; several wells within the SBCWD monitoring network have nitrate concentrations in are above the 45 mg/L MCL for nitrate as nitrate. These areas have long histories of intensive irrigated agricultural and local wastewater disposal.

Nitrate, long identified as a COC in the Basin, has multiple and widespread sources including fertilizer application and wastewater disposal (both municipal and domestic). Given that these sources are on or near the ground surface, shallow groundwater typically is characterized by higher concentrations than deep groundwater. In fact, the highest recent concentrations occurred in shallow wells in the eastern San Juan area.

Figure 4-20 shows the average concentrations at each water quality monitoring well in the Basin that has been sampled in water years 2014 to 2017 for nitrate. **Figure 4-21** shows nitrate time concentration plots from selected monitoring wells (see **Figure 4-15** for locations). Nitrate concentrations are elevated above natural concentrations (typically less than 10 mg/L), but most samples have indicated nitrate concentrations below the MCL of 45 mg/L. With some exceptions, concentrations are relatively stable over time.

Additional review of basin nitrate concentrations was performed by Luhdorff and Scalmanini for the Irrigated Lands program. The report indicated that, for the 1,105 wells used in analysis of nitrate concentrations in the Gilroy-Hollister Valley, 26 percent had average concentrations over the MCL of 45 mg/L (this includes Llagas Subbasin in Santa Clara County, LSCE, 2015).

Water quality in the Basin has not changed significantly since the SNMP concluded that recycled water would not adversely impact water quality. With local exceptions, concentrations of nitrate and TDS remain fairly stable across the subbasin.

4.8. Other Constituents

While TDS and nitrate were selected as constituents of concern, there are other constituents that should continue to be monitored in the event future changes to the basin management affects concentrations.

4.8.1. Perchlorate and Selenium

Perchlorate and selenium in the Basin are associated with regulated facilities.

Perchlorate. Perchlorate (ClO^{4-}) is a byproduct of solid rocket fuel manufacturing and testing, munitions manufacturing, and flare and pyrotechnics manufacturing (Motzer, 2001). It can occur naturally in some fertilizers, kelp, and in caliches and playa crusts. Perchlorate compounds have relatively high water (aqueous) solubilities and densities. Once dissolved in water, the perchlorate anion becomes relatively nonreactive, very stable, and extremely mobile. The California DHS action level and the agricultural water quality limit are both 6 ug/L.

Perchlorate has been associated with three facilities in the Basin: McCormick Teledyne, Whittaker, and the Hollister WWTP. Both the former Whittaker Ordnance facility and the former Teledyne facility have been documented as using perchlorate and releasing it to the environment. Ordnance manufacturing occurred on the Whittaker site since 1957 (Acton Mickelson, 2000) while historical activities on the McCormick Teledyne site included use of perchlorate and trichloroethylene (TCE). Although more than 140 wells in the Basin have been sampled for perchlorate, 94 of those wells are located on the two sites. Offsite monitoring data downgradient of Whittaker and McCormick Teledyne are limited. Both facilities are regulated by RWQCB and perchlorate concentrations are closely monitored on and off site.

Selenium. Selenium concentrations in surface water and groundwater are generally low with concentrations below 12 ug/L, with most stream water averaging 0.2 ug/L. The MCL for Selenium is 50 ug/L, no recent samples (outside of the regulated facilities Whittaker and John Smith Landfill) have concentrations 25 to 50 ug/L.

4.8.2. Hardness

Hardness (total hardness, as $CaCO_3$) is a widespread condition in the Basin indicating that high concentrations of calcium and magnesium ions in water will form insoluble residues with soap. It is a naturally-occurring condition but can be impacted by anthropogenic sources that add calcium or magnesium to the groundwater. Hardness above about 120 to about 150 mg/L is considered hard water with objectionable properties for consumers. A value of more than 200 mg/L can result in scale deposition to pipes. Because there are no drinking water standards for hardness, the practical limitations of hard water (greater than 200 mg/L hardness) and very hard water (greater than 300 mg/L hardness) are used as guidelines for the analysis.

Groundwater is considered hard to very hard throughout most of the Basin. The only water with hardness of less than 200 mg/L is found in the east-central Basin and in the northwest along the Pajaro River.

The natural hardness of the groundwater indirectly relates to increases in groundwater salinity in localized areas due to the use of water softeners. Water softeners work by exchanging the calcium and magnesium ions with sodium ions from sodium chloride. As such, sodium and chloride are concentrated in wastewater. Because much of the wastewater is returned to the Basin through septic tank discharges or wastewater percolation ponds, water softeners have impacted groundwater (JSA, 1998).

4.8.3. Boron

Boron is naturally occurring in the Basin and associated with marine clays, thermal springs, and closed-basin evaporates; clay deposited from marine waters contains 400 to 600 mg/L of boron (Reynolds, 1972). Boron may also occur from anthropogenic sources because it is used in glass manufacturing, soaps and detergents, and flame retardants. Although there are no drinking water standards for boron, DDW has designated an action level of 1.0 mg/L. Plants are especially sensitive to boron, and agricultural standards are set at 0.7 mg/L to 0.75 mg/L. Some damage can occur to crops at even lower concentrations.

Boron has been identified as a COC in the Basin because elevated concentrations historically contributed to abandonment of orchards in Hollister Valley (Eaton et al., 1941). The highest concentrations are associated with a north-south trending band in the Hollister Valley, which is thought to be controlled by geologic conditions and may be related to changing water chemistry along a fault plane at depth.

4.8.4. Metals

Metals including iron, manganese, arsenic, and chromium are naturally occurring in North San Benito.

Arsenic. Arsenic is naturally-occurring and leaches from aquifer materials into groundwater. For California public drinking water systems, the primary MCL for arsenic is 10 µg/L. Long-term exposure to arsenic has been linked to multiple forms of cancer, while short-term exposure to high doses of arsenic can cause other adverse health effects. While there have been no exceedances of the MCL, approximately 74 samples in groundwater wells showed concentrations 5 to 10 ug/L (including SBCWD monitoring wells MW-17, MW-21, MW-42, and MW-43; locations shown in **Figure 4-15**).

Chromium. Chromium occurs in three oxidation states readily found in nature: Cr(0), which occurs in metallic or native chromium (but is rarely found); Cr(III), which occurs in chromic compounds; and Cr(VI), which occurs in chromate and dichromate compounds. Cr(VI) is also known as hexavalent chromium. Most compounds containing Cr(VI) are toxic. Most chromium concentrations in groundwater are low, averaging less than 1.0 µg/L (WHO, 2017). The MCL for chromium is 50 ug/L and the Health-Based Screening Levels (HBSLs) for Hexavalent Chromium 20 ug/L. There have been no recent exceedances of the MCL or HBSL, but approximately 144 samples in groundwater wells showed concentrations of 10 to 20 ug/L for hexavalent chromium.

Iron. In natural water, iron (Fe) is generally analyzed as total iron, which includes Fe^{3+} and Fe^{2+}. Soluble Fe^{2+} is more common in groundwater under reducing conditions, occurring at concentrations ranging from 1.0 to 10 mg/L (Manaham, 1991). The MCL is 300 ug/L and no recent sampled exceeded this limit; however, approximately 44 samples have iron concentrations within 150 to 300 ug/L.

Manganese. Manganese is generally naturally occurring and associated with iron under anaerobic conditions where the more soluble forms may occur. In general, if water has more than 0.20 mg/L, manganese will precipitate upon encountering an oxidizing environment. This will cause an undesirable taste, deposition of black deposits in water mains, water discoloration, and laundry stains (WHO, 2017). The SMCL is 50 ug/L and while eight recent wells exceeded this limit, they are located in areas of the basin with high levels of naturally occurring iron and manganese. Monitoring of manganese should continue to ensure monitored concentrations do not increase or spread in the basin.

4.9. Vertical Variations in Water Quality

Generally, water quality monitoring programs in the Basin do not show a distinct difference of water quality in depth, in part because most of the ambient monitoring wells have long screens. Shallow wells are generally found near regulated facilities and therefore show high concentrations of constituents representing local contamination rather than regional trends. In 2006, a nested well (funded in part by a State Local Groundwater Assistance Act grant) was completed in the Hollister Subbasin to study vertical distribution of groundwater quality in an area of elevated TDS and boron (see well AB303 in **Figure 4-15**). The nested well has five depth-specific ports: A through E from shallow to deep. Initial water quality sampling indicates elevated concentrations of sodium, chloride, TDS, and boron, with indications that deepest groundwater shows poorest quality, for example TDS approximately twice as high as the other shallower zones. Initial water quality data indicate elevated boron in all five screened zones and show a possible trend of increasing boron with depth.

These data may reveal local changes in water quality with depth but may not capture the regional vertical trends.

Impacts to shallow groundwater likely originate from some type of anthropogenic source at the ground surface such as agricultural activities (concentration of salts, fertilizers, and soil amendments), wastewater disposal, or industrial releases. Because almost all shallow water quality data in the Basin were compiled from regulated facility monitoring wells, regulated facilities are the only place that shallow groundwater could be evaluated. In some cases, impacts to shallow groundwater can be attributed to activities at the facilities; however, for some constituents, the correlation is unclear. Regulated facilities at the edges of the alluvial basin often have shallow wells in geologic formations other than basin alluvium and, as such, may exhibit different water chemistry that is independent of anthropogenic impacts. In addition, since shallow groundwater data are missing in the remainder of the Basin, it is difficult to determine whether shallow impacts are widespread. These complications limit the evaluation of shallow groundwater in the Basin and impacts at regulated facilities. Therefore, place names, and regulated facility names in this document are used as location or data source references and should not be concluded to be the source of any water quality impact unless so stated.

Based on regional geology, naturally high TDS and boron is expected at depth (Kilburn, 1972). In addition, regional shallow groundwater generally has relatively high concentrations of TDS and nitrate reflecting agricultural drainage and other anthropogenic sources.

4.10. Seawater Intrusion Conditions

Basin is located inland from Monterey Bay approximately 20 miles upstream from the mouth of the Pajaro River; lowest elevations (at the confluence of the San Benito River and Pajaro River) are above about 110 feet. No risk of seawater intrusion exists in the Basin given its location.

4.11. Interconnection of Surface Water and Groundwater

Interconnection of groundwater and surface water occurs wherever the water table intersects the land surface and groundwater discharges into a stream channel or spring. These stream reaches gain flow from groundwater and are classified as gaining reaches. Conversely, connection can occur along stream reaches where water percolates from the stream into the groundwater system (losing reaches),

provided that the regional water table is close enough to the stream bed elevation that the subsurface materials are fully saturated along the flow path.

Groundwater pumping near interconnected surface waterways or springs can decrease surface flow by increasing the rate of percolation from the stream or intercepting groundwater that would have discharged to the stream or spring. If a gaining stream is the natural discharge point for a groundwater basin, pumping anywhere in the basin can potentially decrease the outflow, particularly over long time periods such as multi-year droughts.

Because of the long dry season that characterizes the Mediterranean climate in San Benito County, vegetation exploits any near-surface water sources, including the water table along perennial stream channels, the wet soil areas around springs, and areas where the water table is within the rooting depth of the plants. Plants that draw water directly from the water table are called phreatophytes. They are able to continue growing vigorously during the dry season and typically stand out in summer and fall aerial photographs as patches of vegetation that are denser, taller, and brighter green than the adjacent vegetation.

Three types of data available for northern San Benito County were evaluated to identify locations of interconnected surface water and groundwater: stream flow, depth to groundwater, and vegetation. Each of these data sets has limitations or inconsistencies—as described below—so they were evaluated collectively to obtain a more reliable indication of groundwater-surface water interconnection. The result is the map of stream reaches known or likely to be interconnected with groundwater shown in **Figure 4-22**. This is primarily a map of stream reaches that might be gaining flow from groundwater. Reaches that are losing but hydraulically connected to groundwater are more difficult to identify. The key resources associated with interconnection are phreatophytic riparian vegetation and reaches with perennial pools or flow, and both of those are most commonly associated with gaining reaches.

4.11.1. Stream Flow Measurements

Manual measurements of flow at multiple locations along a stream during steady flow conditions can reveal reaches that gain or lose water. This was done on multiple dates in the late 1990s and early 2000s for many of the creeks that flow across the Basin (JSA, 1999a, 1999b, 2000, and 2001; Yates et al., 1999; Yates, 2002, 2003, 2005a, and 2005b). In general, the creeks and rivers lose water except where they approach a fault or a narrow spot in the valley floor alluvium. For example, Pacheco Creek has a short gaining reach where it crosses the Ausaymas Fault at Highway 156 and a longer gaining reach as it approaches San Felipe Lake and the Calaveras Fault. Similarly, the San Benito River gains flow as it nears Highway 101 at the downstream end of the San Juan Valley. The Pajaro Rive likewise gains flow as it approaches the narrow gap at the west end of the Lomerias Muertas hills. Farther up the San Benito River, gaining flow reaches were inferred from the presence of dense riparian vegetation and topography rather than from flow measurements.

4.11.2. Depth to Groundwater

Depth to groundwater provides a general indication of locations where gaining streams and riparian vegetation are likely to be present. However, available data are of limited use for this purpose due to insufficient geographic and vertical coverage. Available data are almost entirely from water supply wells, which are typically screened 200 to 500 feet below the ground surface. The groundwater elevation (potentiometric head) at the depth of the well screen can be different from the true water table, which

is the first zone of saturation reached when drilling down from the ground surface. Large downward head gradients within the aquifer system have been documented from pairs of shallow and deep wells, and upward gradients are present where there are flowing wells (see Section 4.1.5, Vertical Groundwater Gradients). The persistence of riparian vegetation through droughts also implies the occurrence of large downward gradients, as discussed below.

The second limitation is the sparse geographic distribution of groundwater elevation monitoring wells. Creeks and rivers that lose water commonly form a mound in the water table near the creek. The height and width of the mound depends on the transmissivity of the shallowest aquifer. For example, groundwater elevations in a shallow well adjacent to the Arroyo Seco in the Salinas Valley rose 5 to 10 feet more than groundwater elevations in wells 1,000 feet away when the river started flowing (Feeney, 1994). A groundwater ridge up to 12 feet high develops beneath Putah Creek in Yolo County during the flow season, but the width of this ridge was estimated to be only a few hundred feet (Thomasson et al., 1960). These examples suggest that shallow wells within 100 to 200 feet of a stream channel would be needed to confirm the presence of hydraulic connection between surface water and groundwater when groundwater elevations in deep water supply wells are within perhaps 30 feet of the river bed elevation.

Contours of depth to groundwater in fall 2017 correlate in a general way with locations of observed gaining stream reaches (**Figure 4-22**). These depth to groundwater contours were interpolated from monitored well measurement for the purpose of evaluating correlations to surface water bodies. The gaining reaches along the lower ends of Pacheco Creek, Tequisquita Slough, and the San Benito River are all where contoured groundwater elevations in wells are about 20 feet below the ground surface. Similarly, the gaining reach and riparian vegetation along the San Benito River where it approaches the Calaveras Fault coincide with relatively shallow depth to water.

4.11.3. Riparian Vegetation

Vegetation patterns along streams can also be used to map potential interconnection of surface water and groundwater because growth is more vigorous where plant roots can reach the water table. There are limitations to this approach, however. First, some plant species are facultative phreatophytes, which means they will establish and grow with or without access to the water table. An example is mulefat (Baccharis salicifolia), which in the Natural Communities Commonly Associated with Groundwater (NCCAG) map was dominant along broad, gravelly reaches of the San Benito River where shallow groundwater was not likely present (DWR et al., 2018d). More obligate phreatophytes such as cottonwood (Populus fremontii) correlated more closely with gaining stream reaches.

A second limitation is that streams that convey releases from upstream reservoirs can “irrigate” riverbank vegetation in summer, mimicking the effect of a shallow water table. In northern San Benito County, the District currently manages releases from Hernandez Reservoir to provide summer flow down the San Benito River as far as Lucy Brown Road near San Juan Bautista, when water is available to do so. Similarly, releases from Pacheco Reservoir sustain flow down Pacheco Creek as far as Highway 156 from June to October in most years (substantially less during droughts).

A third limitation is that land clearing for agriculture has reduced the width of the riparian vegetation corridor along many stream reaches to less than 100 feet. Where shallow groundwater is present, the width of the riparian vegetation corridor would typically be wider in the absence of clearing.

For the purposes of this GSP, riparian vegetation GDEs are defined as areas of dense riparian tree canopy more than one tree wide along streams where depth to groundwater is plausibly less than 30 feet. There areas were mapped from fall 2016 aerial photographs where the riparian corridor width exceeded 100 feet and tree canopy density exceeded 80 percent (see **Figures 4-22** and **4-24** for locations). The width criterion selects for areas more likely to have shallow groundwater (rather than streambank "irrigation" by a losing stream). Although riparian corridors can be as little as two tree crown diameters wide (McBride and Strahan, 1984), the ecological integrity and value of riparian vegetation as measured by macroinvertebrate diversity has been shown to increase with corridor width up to about 250 feet in northern California streams (Mahoney and Erman, 1984). Also, a minimum buffer zone for land development of 100 feet along creeks is designated in Humboldt and Ventura Counties (Woodroof and Roberts, 1984). The density criterion also tends to differentiate between phreatophytic and non-phreatophytic vegetation, based on other indicators of the presence of shallow groundwater.

4.11.4. Springs and Seeps

Wetland GDEs are defined as springs, seeps, and wetlands supported by groundwater within the Basin. The locations of these GDEs were identified by selecting from candidate sites included as springs, seeps, or wetlands in the NCCAG geodatabase. NCCAG compiled the sites from other databases based on the frequency of flooding. About half of the features are classified as seasonally flooded, which is more likely to be associated with localized ponding of rainfall runoff than discharge of regional groundwater. Accordingly, the seasonally flooded sites were omitted. Sites along stream channels were also omitted, as those areas were already addressed in the evaluation of gaining/losing stream reaches and riparian vegetation. The remaining sites were each compared with a fall 2016 high-resolution aerial photograph to verify that greener vegetation was present at the site, which is the typical effect of perennial shallow groundwater. This screening process resulted in the identification of 26 sites that could plausibly be locations of groundwater discharge. Of those, eight were in upland areas far from large wells and thus unlikely to be impacted by pumping. An additional five were stock ponds whose source of water was uncertain. Some might be excavated springs; others might be simply runoff impoundments. Vegetation around the ponds did not show evidence of a shallow water table. Finally, the stock ponds were also in upland areas where effects of pumping in the valley floor areas would likely be negligible. One of the remaining 13 sites was the Pajaro River Wetland Mitigation Bank. The others were on the upgradient side of a fault, where shallow groundwater is or could be present. Ten of those were sag ponds along the Calaveras Fault or depressions feeding into San Felipe Lake, and two were on the southwest side of the San Andreas Fault near San Juan Bautista. The locations of these 13 wetland GDEs are shown on Figure 4-22, and they could potentially be impacted by groundwater pumping.

As an empirical check of whether low groundwater elevations might have impacted the springs and seeps during the 2013 to 2014 drought, each site was examined in Google Earth aerial images for several dates between 2010 and 2016. Only four of the 25 sites appeared drier in 2016 than 2010, and three of those were along the upgradient side of the Calaveras Fault near Tequisquita Slough and San Felipe Lake. Those wet areas might have been diminished by low groundwater elevations. However, a reduction in surface inflow during the drought could possibly have caused similar effects.

4.11.5. Annual Depletion of Groundwater

The degree to which groundwater pumping depletes stream flow depends partly on groundwater elevations. When groundwater elevations are low—such as during the decades prior to surface-water

importation or during prolonged droughts—vertical head gradients within the Basin exceed 1.0 in places, which means there is an unsaturated zone between shallow aquifers and deeper aquifers tapped by water supply wells. Under that circumstance, additional groundwater pumping and groundwater elevation lowering has no effect on stream flow. The rate of stream percolation is governed by the permeability of the creek bed. When groundwater elevations are very high—as occurs during wet years or sequences of wet years—stream percolation is reduced due to lack of vacant storage space within the groundwater system. This reduction in percolation is called "rejected recharge" and became noticeable beginning in the late 1990s (JSA, 2001; Yates, 2003, 2004, and 2005).

An empirical test of stream flow depletion by pumping was obtained using the groundwater model. The results are described in Section 6 "Sustainability Criteria".

4.11.6. Identification of Groundwater-Dependent Ecosystems

Groundwater dependent ecosystems (GDEs) can include plants and animals. Species in those habitats depend on the presence of a shallow water table, pond, or stream flow. Figure 4-22 identifies potential GDEs as phreatophytic riparian vegetation and as springs and seeps, and also identifies gaining stream reaches (based on depth to groundwater). Evaluating the connection between groundwater pumping and the health of those species requires careful evaluation of biological and hydrological factors, including the role of groundwater in the life history of the species (fish passage, spawning, dry-season growth), the timing of water utilization (seasonal, drought survival), the sources of water supplying the habitat (regional groundwater discharge, seasonal wetlands, irrigation tailwater, wastewater), and the hydraulic connection between shallow and deep groundwater. These factors are considered separately for vegetation and animals, below.

4.11.7. Vegetation

Riparian vegetation GDEs are defined as phreatophytic trees and shrubs along streams where the vegetation corridor was at least 100 feet wide and consisted primarily of trees with at least 80 percent canopy coverage and where the depth to groundwater was plausibly less than 30 feet. Vegetation matching these criteria was present in fall 2016 along much of Pacheco Creek and the Pajaro River, several locations along the San Benito River, and short reaches along several smaller streams (**Figures 4-23** and **4-24**). The total area of phreatophytic vegetation was 1,650 acres. A comparison of these areas with vegetation polygons in the NCCAG vegetation map indicated that common species in the phreatophyte areas along the San Benito River (which had more thorough mapping than other streams in the Basin) are Fremont cottonwood, southwestern North America riparian, flooded and swamp forest, mulefat, valley oak (in upper stream terrace locations), and valley foothill riparian.

Phreatophytic riparian vegetation will exploit shallow groundwater throughout the dry season whenever it is available. However, the plant species have varying ability to survive on soil moisture alone if the water table drops below the bottom of the root zone, such as during a drought. Furthermore, groundwater elevations in shallow aquifers are typically more stable than groundwater elevations in deeper ones utilized for water supply. For both of these reasons, the relationship between groundwater elevations in water supply wells and vegetation health is complex.

An empirical method for relating vegetation health to groundwater elevations in wells is to compare aerial photographs of phreatophytic riparian vegetation before and after droughts. If the low groundwater elevations during the drought affected the shallow water table and plants significantly,

die-back of the riparian canopy would be expected. This approach was implemented by comparing aerial photographs taken in November 2010 and October 2016, which were before and after a drought during which groundwater elevations in many wells declined 20 to 40 feet. Only a few of the areas mapped as riparian vegetation appeared to experience a reduction in vegetation coverage during the drought. Close-up aerial photographs for both dates are shown for two of these areas in **Figure 4-23**. The locations are on Tres Pinos Creek and the San Benito River (**Figure 4-22**). Examples of areas where vegetation density and/or vigor appeared to have decreased between the two dates are circled in the figure. There are no monitoring wells near site A on Tres Pinos Creek, and groundwater elevations in wells near site B on the San Benito River declined 30 feet during the drought.

The general conclusion that can be drawn from the pre- and post-drought aerial photograph comparison is that riparian vegetation tends to persist even when groundwater elevations in nearby water supply wells are 35 to 40 feet below the ground surface for a period of two years. A small percentage of phreatophytic riparian vegetation appears to die back during such drought events but later regenerates.

The relatively minor effects of groundwater declines during the 2013 to 2014 drought in northern San Benito County can be contrasted with the more pronounced effects of groundwater declines during the 1976 to 1977 drought in the Carmel Valley, a coastal basin 30 miles to the south. Groundwater elevations along a two-mile segment of the narrow alluvial valley near a cluster of large municipal wells declined only about 6 feet during summer in typical years but declined 25 to 30 feet over the two-year drought period (Kapple et al., 1984 and Kondolf and Curry, 1986). This amount and duration of decline killed most of the riparian vegetation in that area, and decay of the tree roots that normally bind the riverbank soils led to unprecedented amounts of bank erosion in subsequent peak flow events. Key differences between the two locations are that the Carmel Valley alluvial aquifer is only 80 to 100 feet thick with no confining layers, and the municipal wells were all within a few hundred feet of the river. Thus, drawdown was focused close to the river, and the groundwater elevations in the wells reflected the actual water table. In northern San Benito County, large irrigation and municipal wells are typically screened between 200 and 500 feet below the ground surface, and the stratigraphy in most places includes fine-grained layers that attenuate the effects of deep pumping on the water table in the shallowest aquifer. A study of shallow groundwater conditions in the San Juan Valley found groundwater elevation differences of up to 20 feet between a well 10 feet deep and a nearby well 89 feet deep, even in a wet year (Yates et al., 1999). At another location with a longer historical record, groundwater elevations in a well 130 feet deep were up to 40 feet lower than in a nearby well 78 feet deep. Also, pumping in northern San Benito County is not focused near streams and rivers to the extent that it is in Carmel Valley. The horizontal and vertical separation of the pumping stress in deep aquifers from the water table in the shallowest aquifer in San Benito riparian areas appears to have diminished the impact of pumping, allowing the vegetation to survive.

4.11.8. Animals Dependent on Groundwater

Animals that depend on groundwater include fish and other aquatic organisms that rely on groundwater-supported stream flow and amphibious or terrestrial animals that lay their eggs in water. Management of habitat for animals typically focuses on species that are listed as threatened or endangered under the state or federal Endangered Species Acts. That convention is followed here. The biological resources element of the 2010 San Benito County General Plan identifies three listed species that require aquatic habitat: California red-legged frog, California tiger salamander, and steelhead trout (EMC Planning Group, Inc., 2015). Critical habitat areas for those species are shown in **Figure 4-24** (USFWS, 2019a and 2019b).

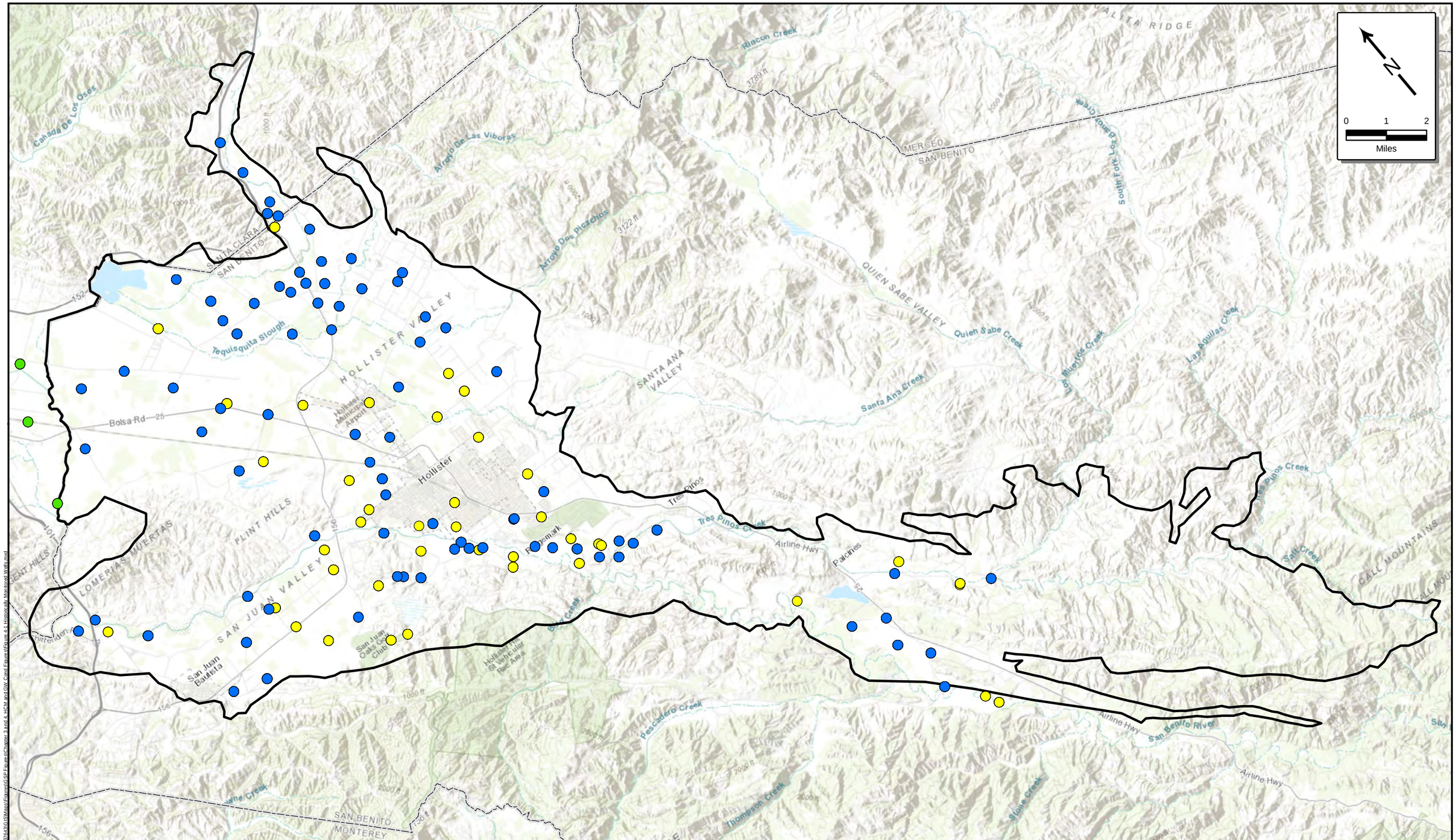
Critical habitat for red-legged frog is present along the San Benito River from Bird Creek up through the Paicines Valley, along Tres Pinos Creek between Tres Pinos Creek Valley and Southside Road, and in the hills surrounding Pacheco Creek Valley as it approaches the Hollister Valley. Red-legged frogs live in sheltered backwaters of ponds, marshes, springs, streams, stock ponds, and reservoirs. Deep pools with dense stands of overhanging willows and an intermixed fringe of cattails are considered optimal habitat. Aquatic habitat is required year-round (USFWS, 2019a). Groundwater pumping along the reaches of the San Benito River and Tres Pinos Creek within the critical habitat area could potentially decrease the area of suitable habitat along those streams or cause those areas to be intermittently dry.

There are two areas of critical habitat for tiger salamander in the Basin: a large area adjacent to San Felipe Lake and in the hills north of the lower end of Pacheco Creek and an area north of Highway 25 and east of Fairview Road that is within the Basin but generally undeveloped for agriculture or urban land uses. Tiger salamanders require aquatic habitat only seasonally—generally from November to April. They estivate (enter a dormant state) in underground burrows during the dry summer period. During the wet winter months, they spawn and live in and near pools and ponds. They prefer seasonal ponds such as vernal pools or stock ponds that are allowed to go dry (USFWS, 2019b). The seasonal character of the preferred pools indicates that they are not supported by regional groundwater discharge and therefore not affected by groundwater pumping.

Steelhead trout use creeks and rivers that cross the Basin only for passage between the ocean and spawning areas upstream of the Basin. Waterways designated as critical habitat are the San Benito River, Pajaro River, Pacheco Creek, and Dos Picachos Creek (and the reach of Tequisquita Slough that connects it to San Felipe Lake and Pacheco Creek). Adult steelhead migrate upstream from the ocean to headwaters areas to spawn, and smolts (juveniles) migrate downstream to the ocean upon reaching a certain size and maturity. Creeks and rivers crossing the Basin provide continuous hydrologic connection between the ocean and spawning areas only seasonally—primarily during and following winter storm events. The reaches within the Basin are not used as year-round rearing habitat. Adult steelhead migrate upstream between December and March, peaking in January and February (Moyle, 2002). Downstream migration of smolts occurs as winter base flow recedes in spring. This occurs earlier in southern California streams relative to northern California streams because of the shorter flow season. Migration in both directions requires that flow be continuous to the ocean and sufficiently high to provide adequate water depth for the fish to swim. Based on stream flow records for Pacheco Creek, flow becomes too low for smolt migration in April of normal years, May of wet years, and March or earlier in dry years.

The potential impact of groundwater pumping on steelhead migration is to slightly shorten the duration of windows of opportunity for migration. At the beginning of the winter flow season, percolation losses are relatively high as groundwater elevations recover. However, early-season flows are typically flashy in response to storm events, with flows that greatly exceed percolation rates. In spring, base flow recedes more gradually and usually drops below minimum migration flows before irrigation pumping ramps up for the dry season. If there is overlap between the flow season and irrigation season, flow depletion could shorten the smolt passage window. For example, if the minimum passage flow for smolt migration along Pacheco Creek were 25 cubic feet per second (cfs) measured at the gauge near Dunneville, then based on typical flow recession rates, a hypothetical 3 cfs of pumping depletion would shorten the migration window by 1 to 2 days.

Figure 4-24 identifies GDEs in terms of phreatophytic riparian vegetation and potential steelhead passage streams. Additional analysis of potential groundwater pumping impacts on vegetation and animals is included in Section 6, Sustainability Criteria.



SBCWD Monitored Wells, October 2017

SCVWD Monitored Wells, October 2017

Well Monitored in Prior Years and not October 2017

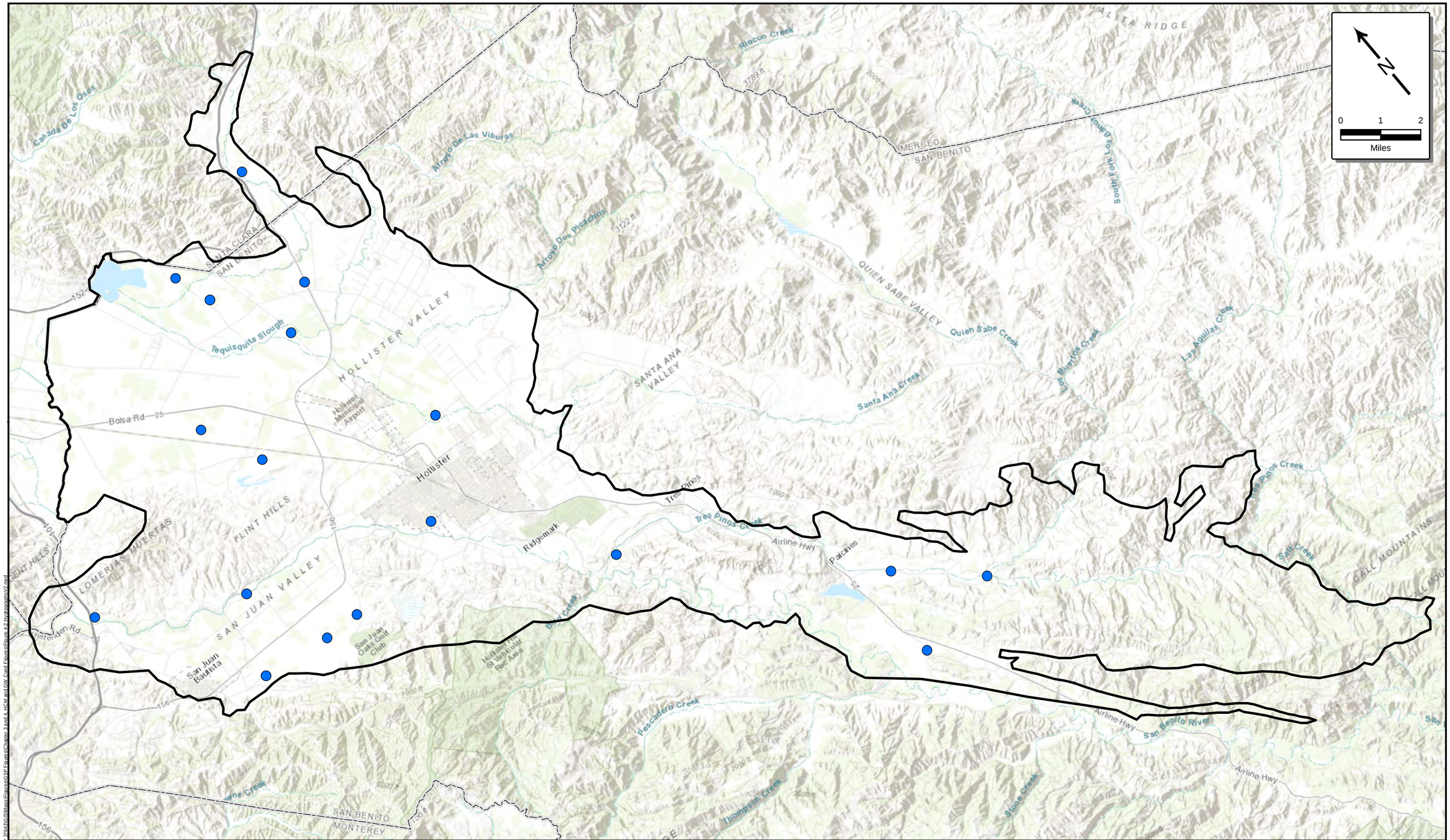
North San Benito Basin

San Benito County

November 2021

TODD GROUNDWATER

Figure 4-1
Historically Monitored Wells



Well with Representative Hydrograph

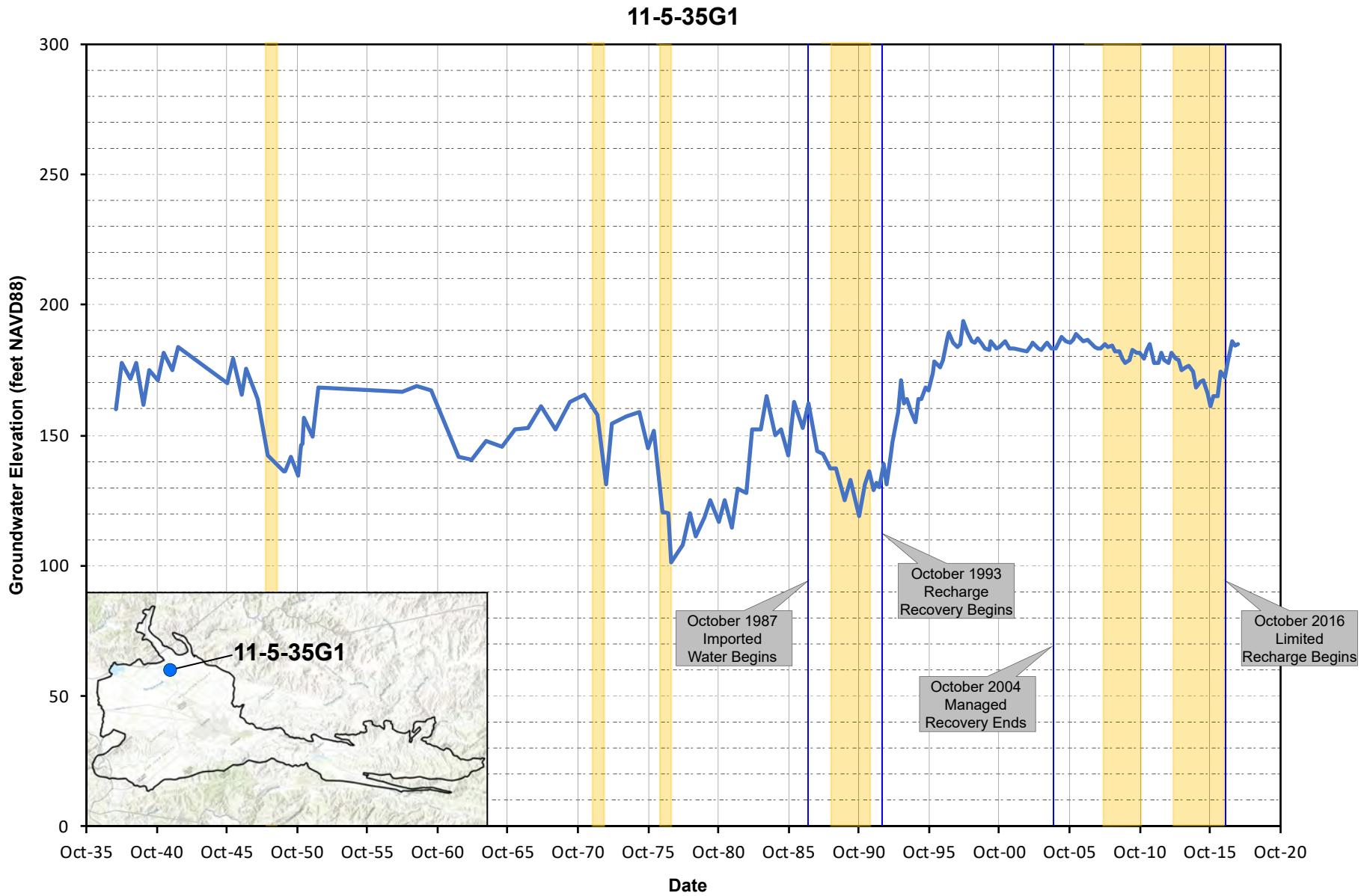
North San Benito Basin

San Benito County

November 2021

TODD GROUNDWATER

Figure 4-2
Location of Wells with Representative Hydrographs

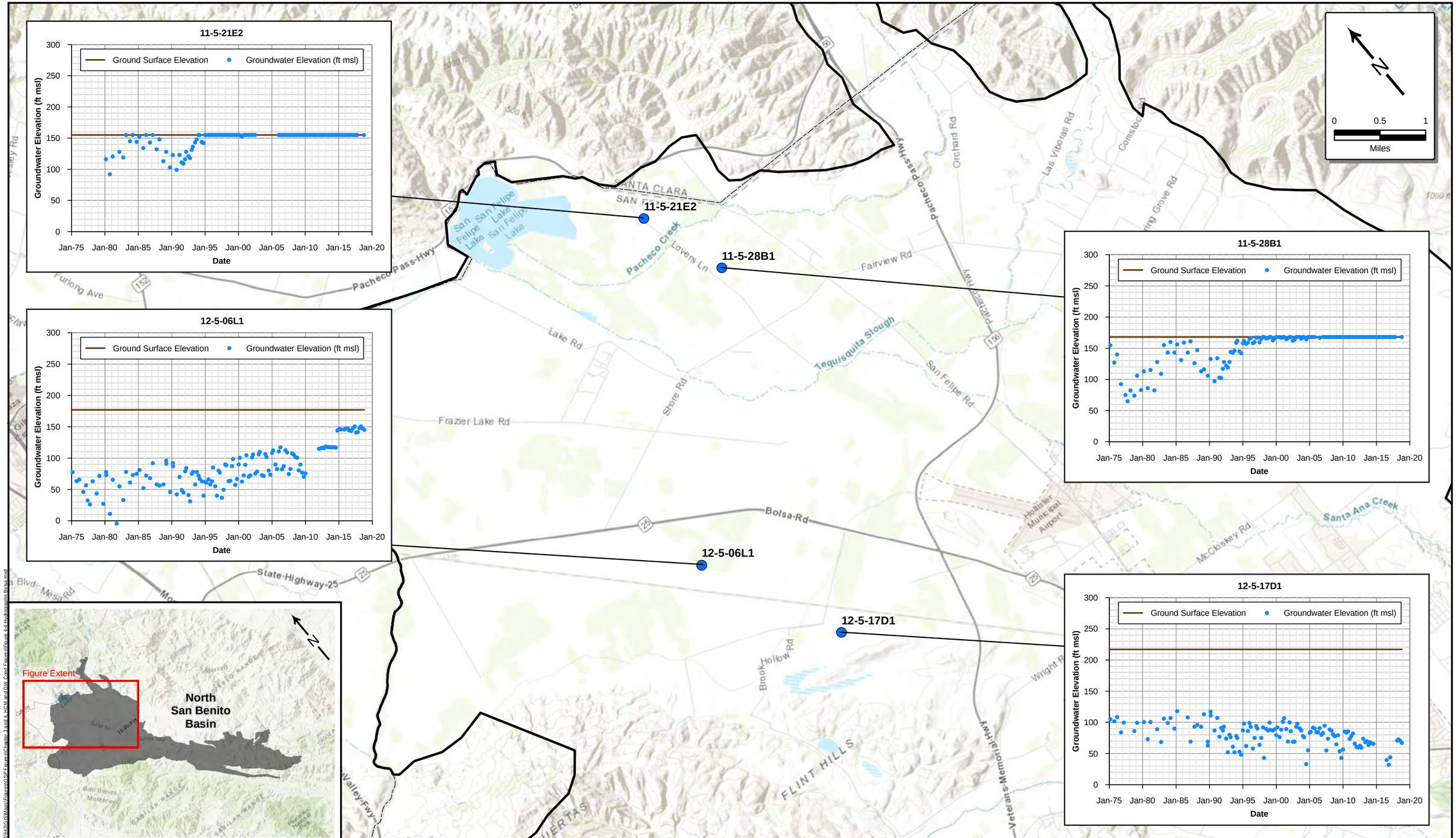


Drought Periods

November 2021

TODD GROUNDWATER

Figure 4-3
Representative Long Term Groundwater Elevations

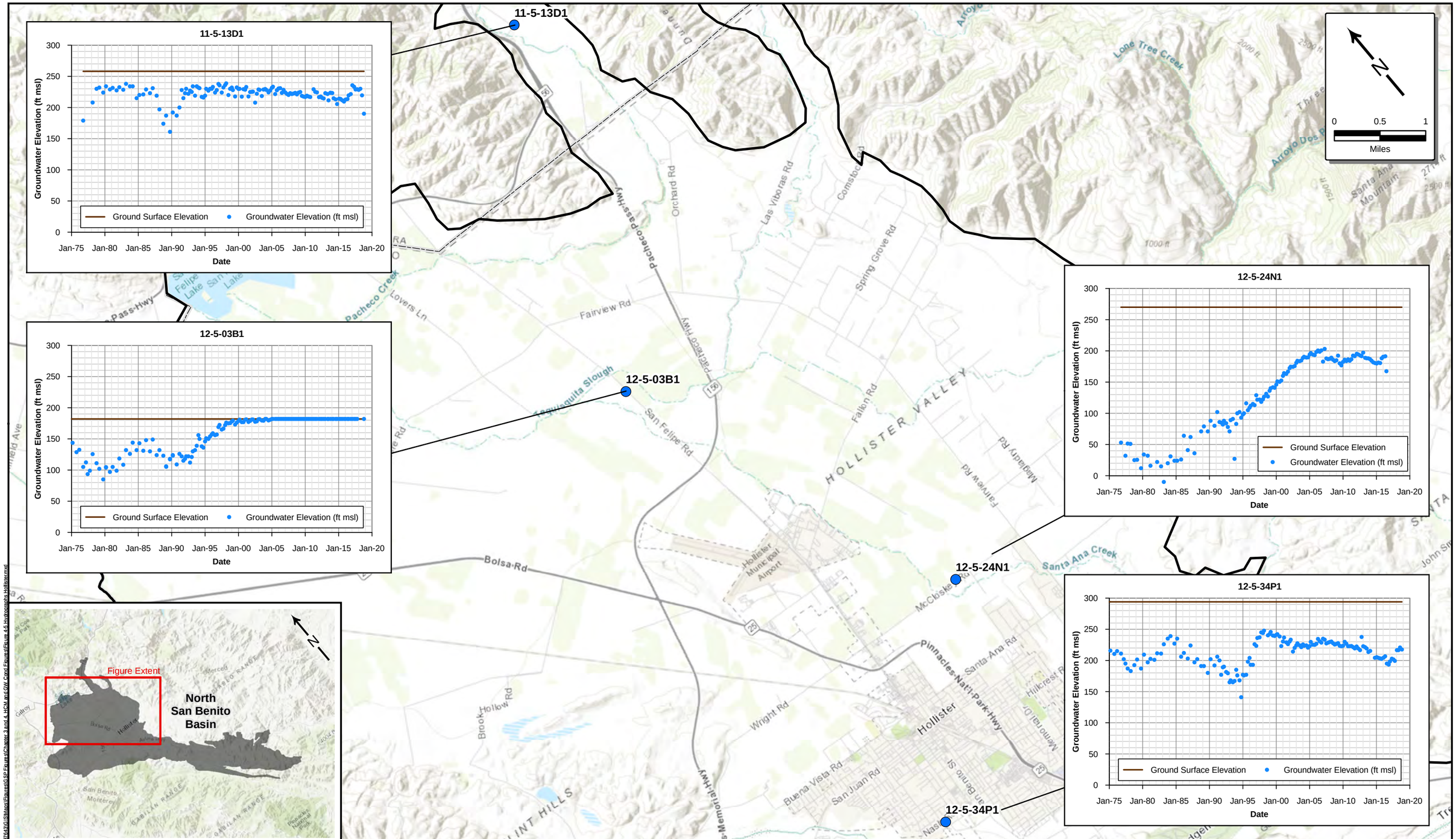


Well with Representative Hydrograph
North San Benito Basin
San Benito County

November 2021

TODD GROUNDWATER

Figure 4-4
Representative Hydrographs
Bolsa Management Area



Well with Representative Hydrograph

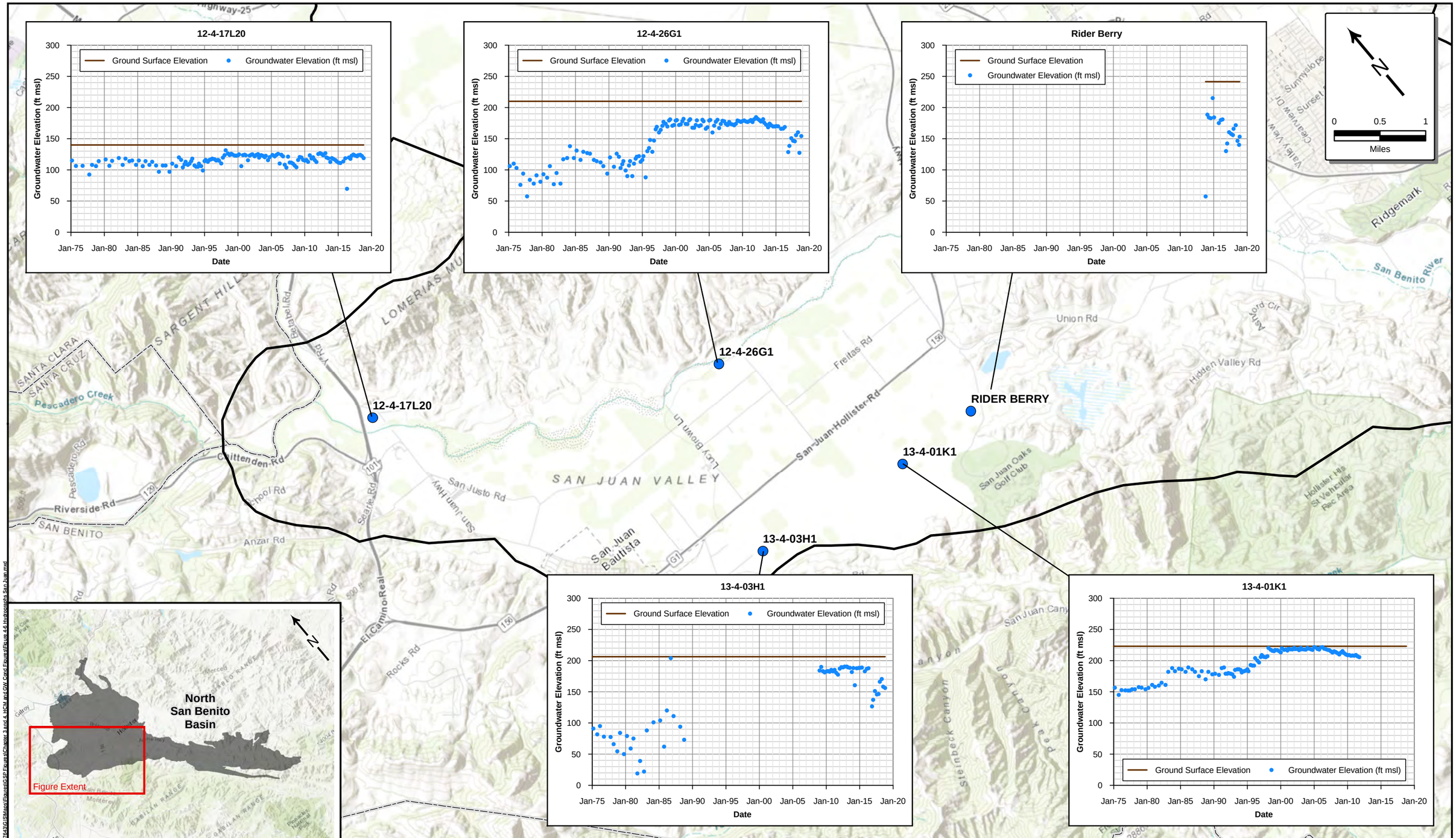
San Benito County

North San Benito Basin

November 2021

TODD GROUNDWATER

Figure 4-5
Representative Hydrographs
Hollister Management Area

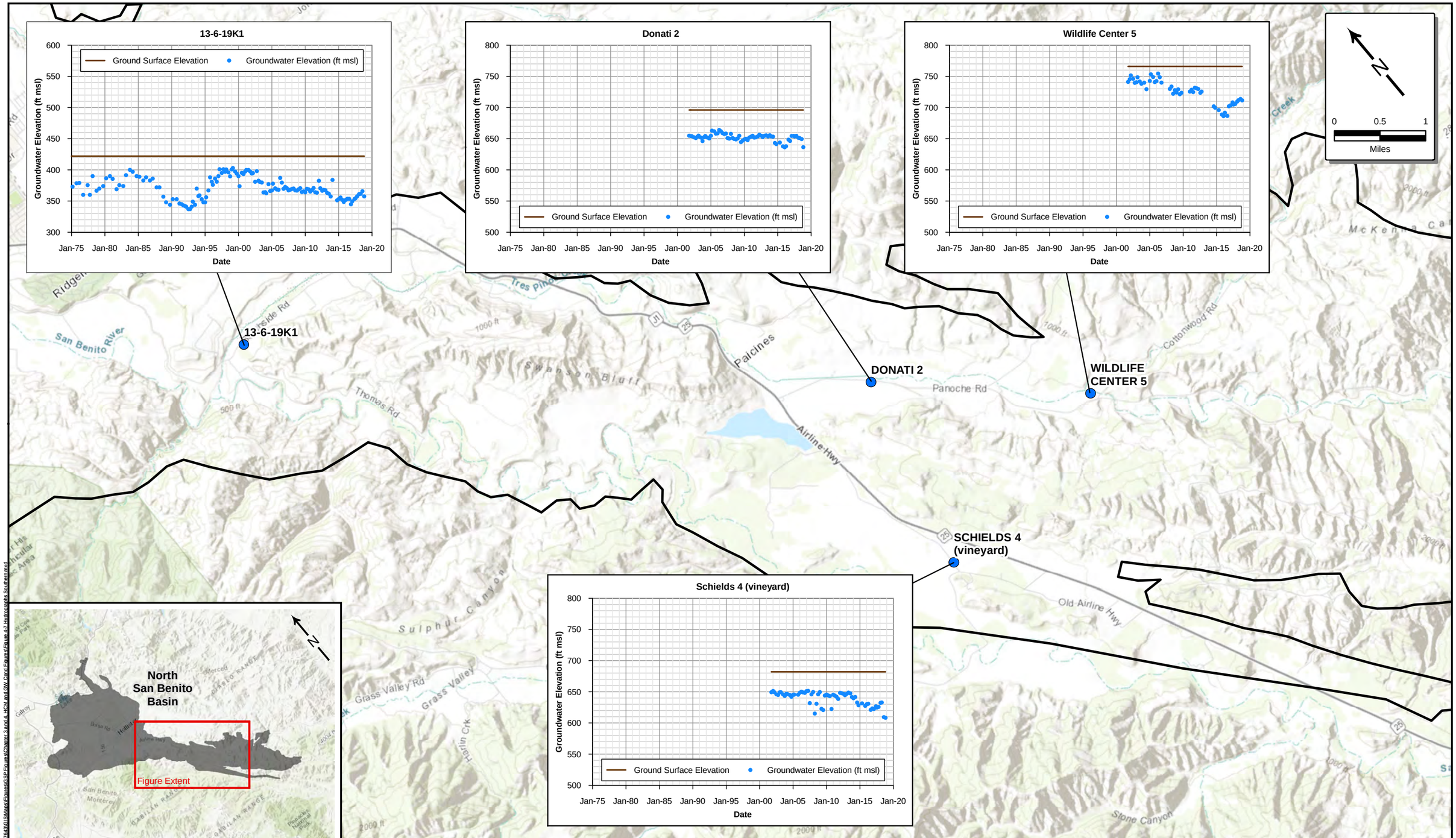


Well with Representative Hydrograph
San Benito County
North San Benito Basin

November 2021

TODD GROUNDWATER

Figure 4-6
Representative Hydrographs
San Juan Management Area



Well with Representative Hydrograph
San Benito County
North San Benito Basin

November 2021

TODD GROUNDWATER

Figure 4-7
Representative Hydrographs
Southern Management Area

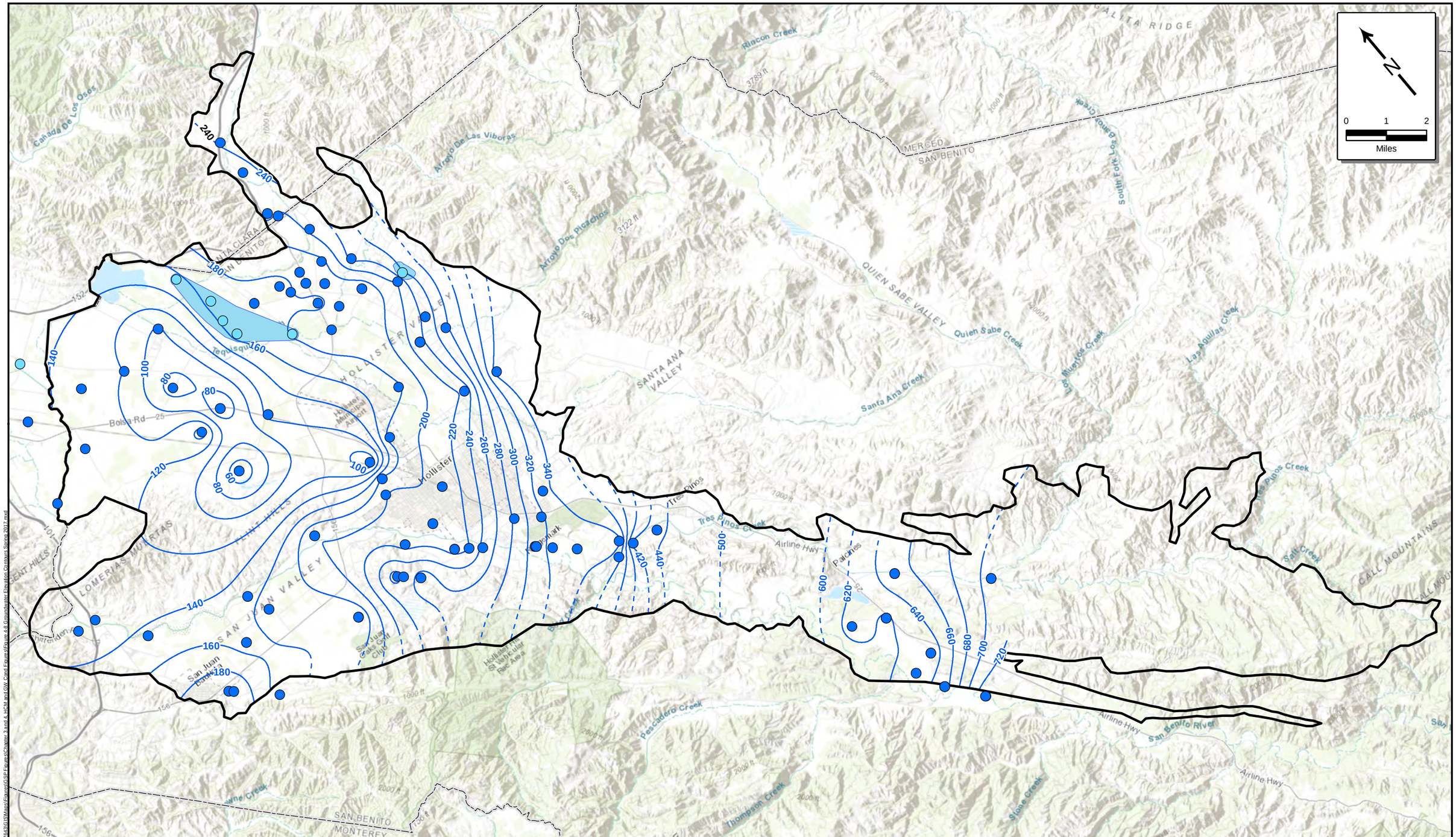
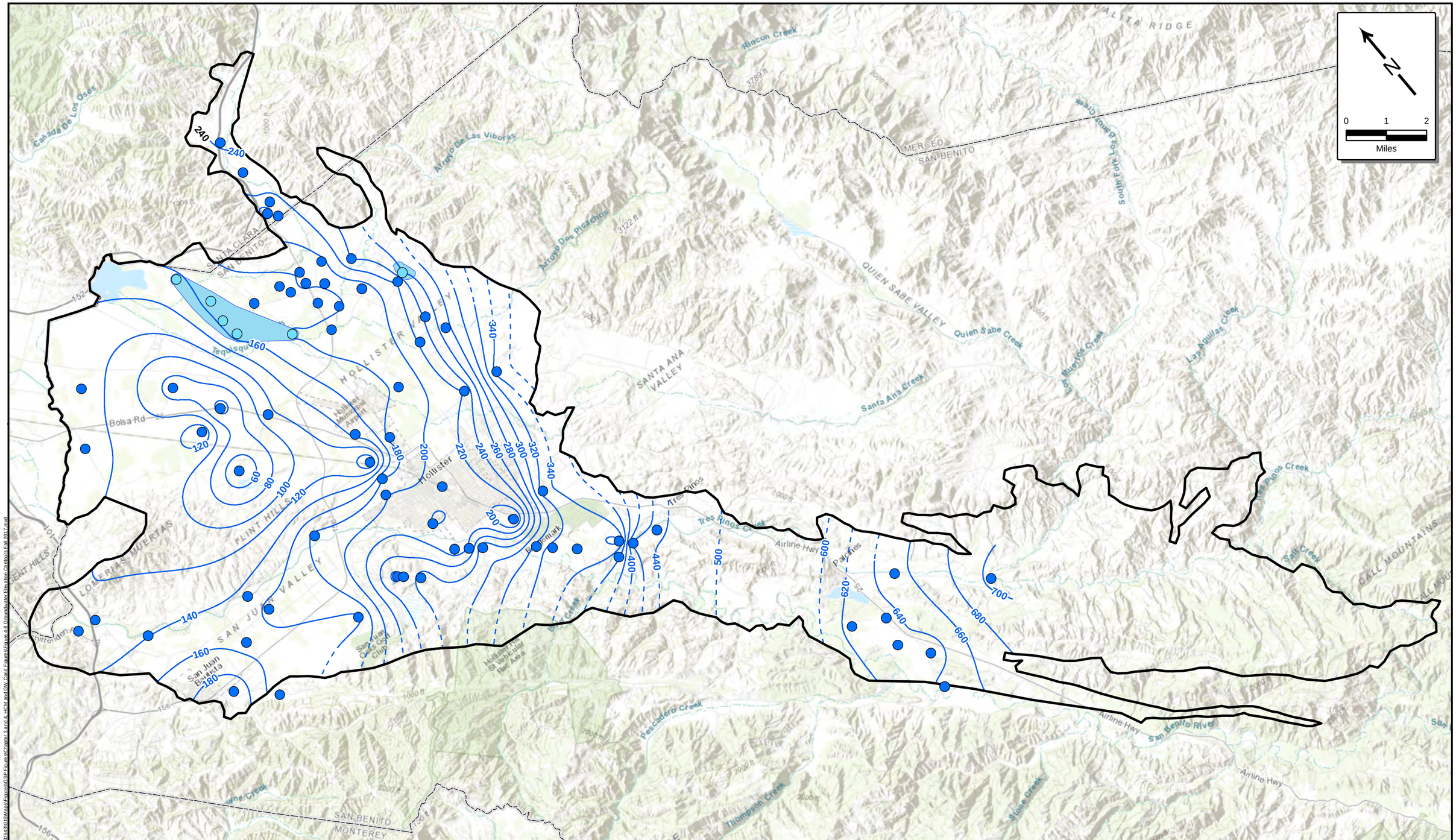


Figure 4-8
Groundwater Elevation Contours, Spring 2017



Flowing Artesian Well, Fall 2017

Monitored Well, Fall 2017

20-foot groundwater elevation contour, feet above msl

20-foot groundwater elevation contour, dashed where uncertain due to insufficient data

Approximate Areas of Flowing Wells

North San Benito Basin

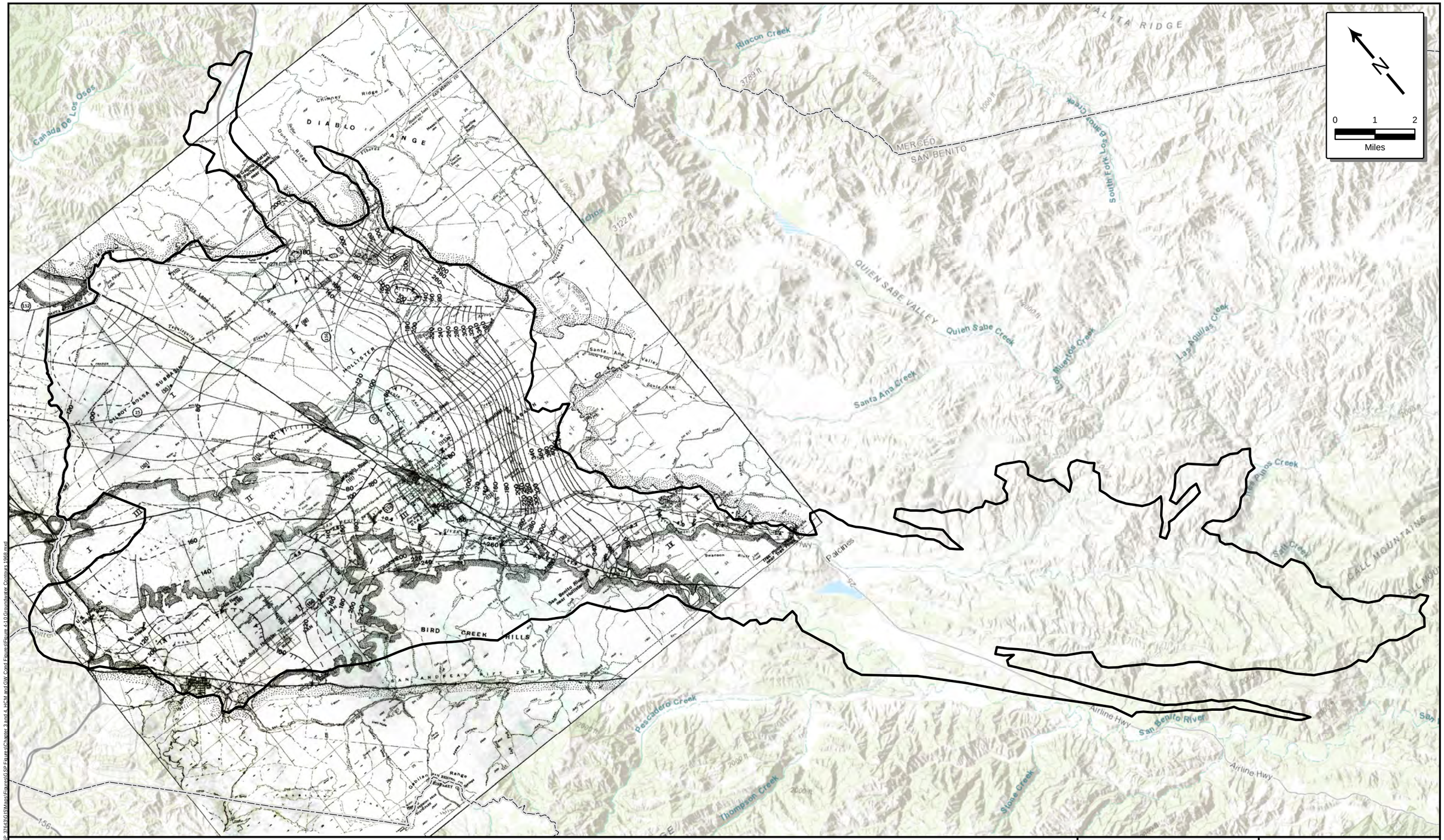
San Benito County

Note:
Groundwater elevation contours not estimated in areas of the basin with no groundwater monitoring data

November 2021

TODD GROUNDWATER

Figure 4-9
Groundwater Elevation Contours, Fall 2017



North San Benito Basin

San Benito County

Groundwater elevation contours after Kilburn, 1973, Plate 6

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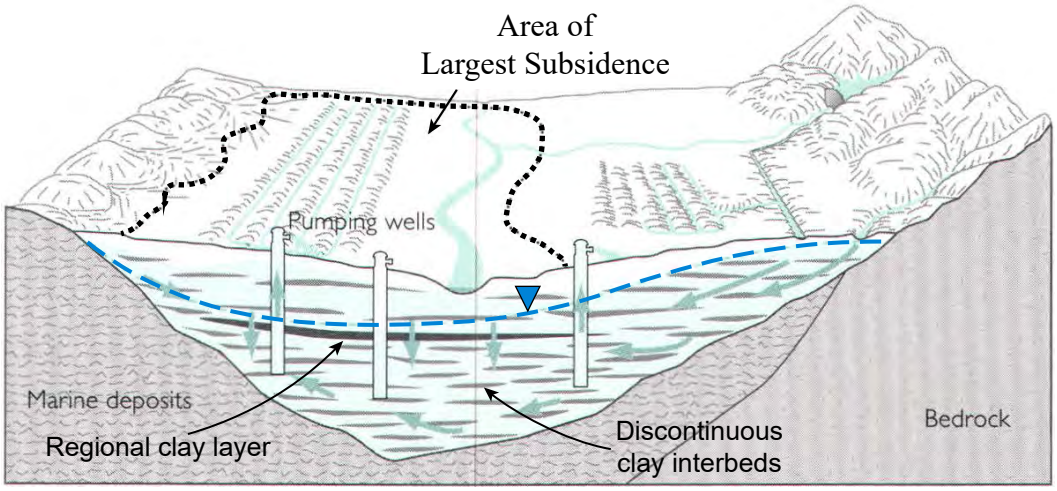
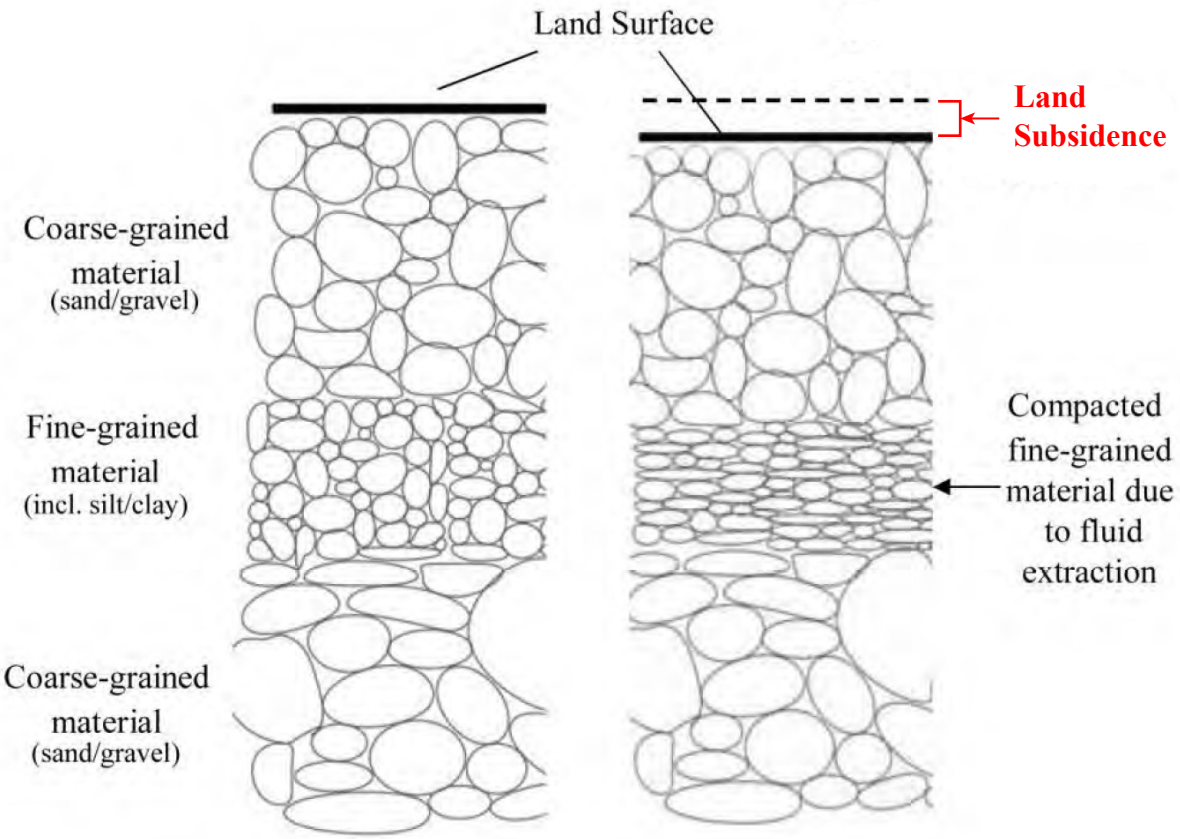
TODD GROUNDWATER

Figure 4-10
Groundwater Elevation Contours, 1968



Source: Galloway et al., 1999.



After LSCE et al., 2014.

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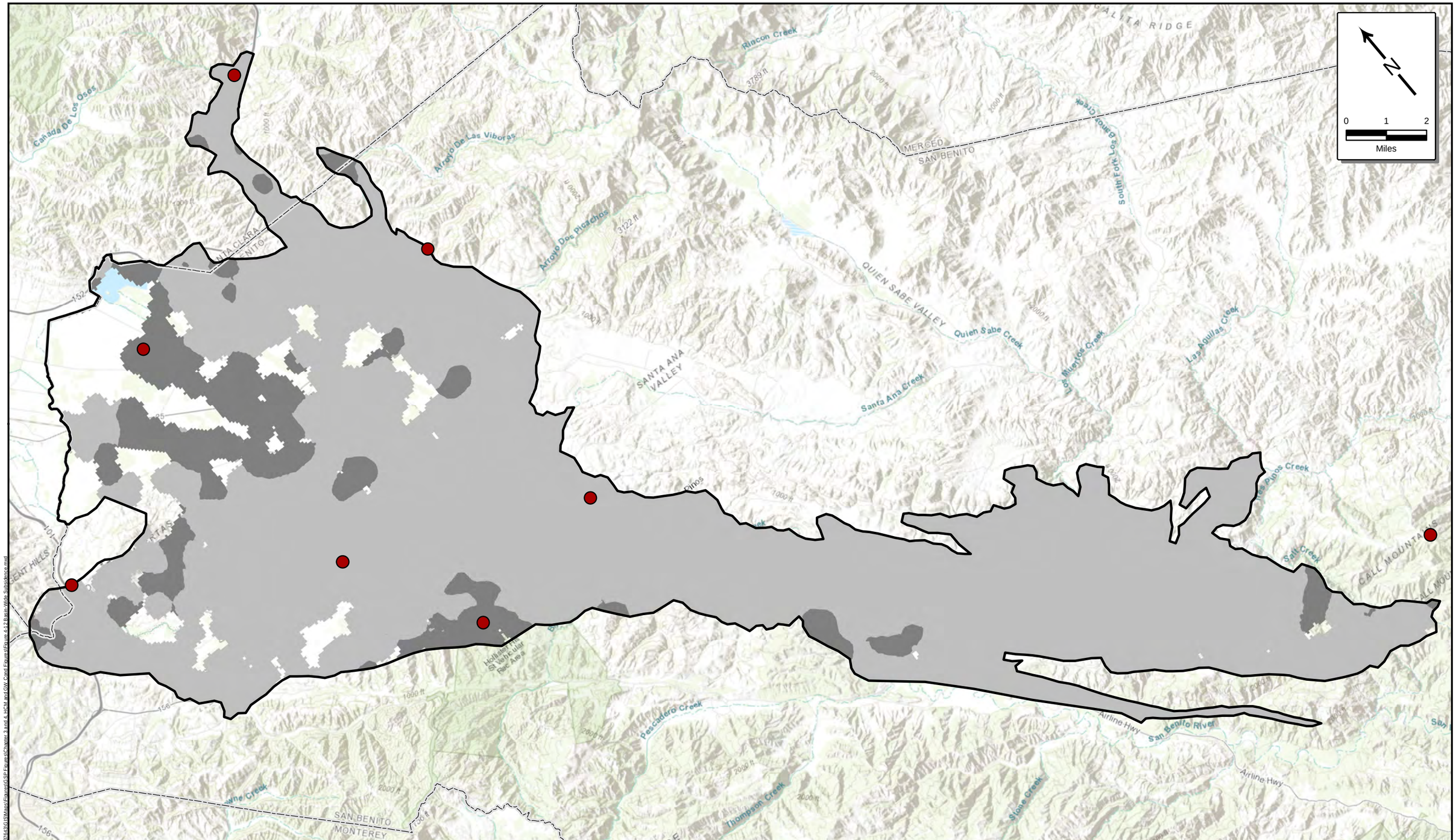
Figure 4-11
Concepts of
Land Subsidence



UNAVCO Stations

North San Benito Basin

San Benito County

Vertical Displacement (inches)

-2 - 0 inches

0 - 2 inches

Note:
Vertical displacement data from California Department of Water Resources measured between 6/13/2015 and 9/19/2019 (Tre/Altamira).

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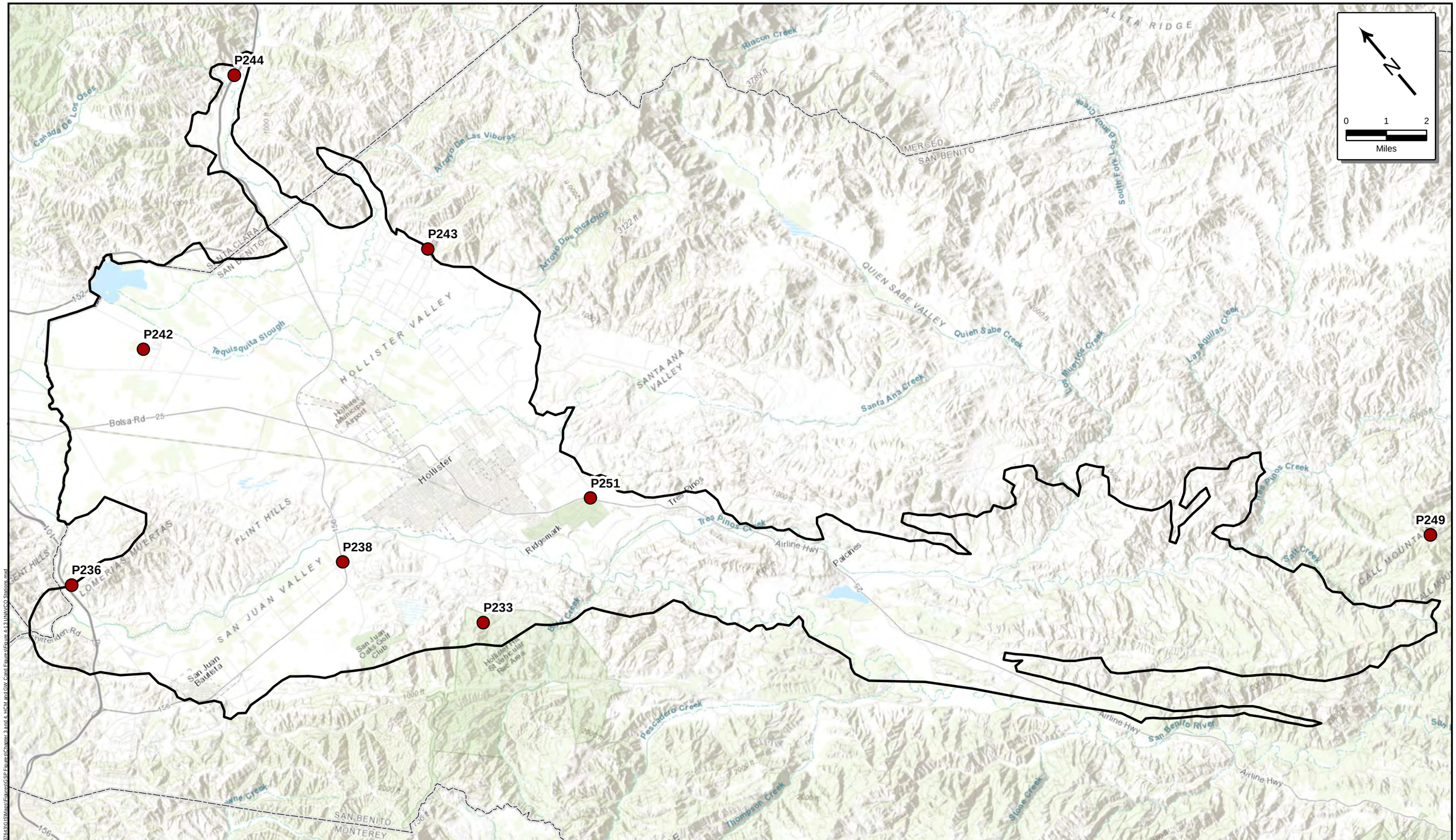
TODD GROUNDWATER

Figure 4-12
Basin-Wide Subsidence Estimates from Satellite Measurements



UNAVCO Stations

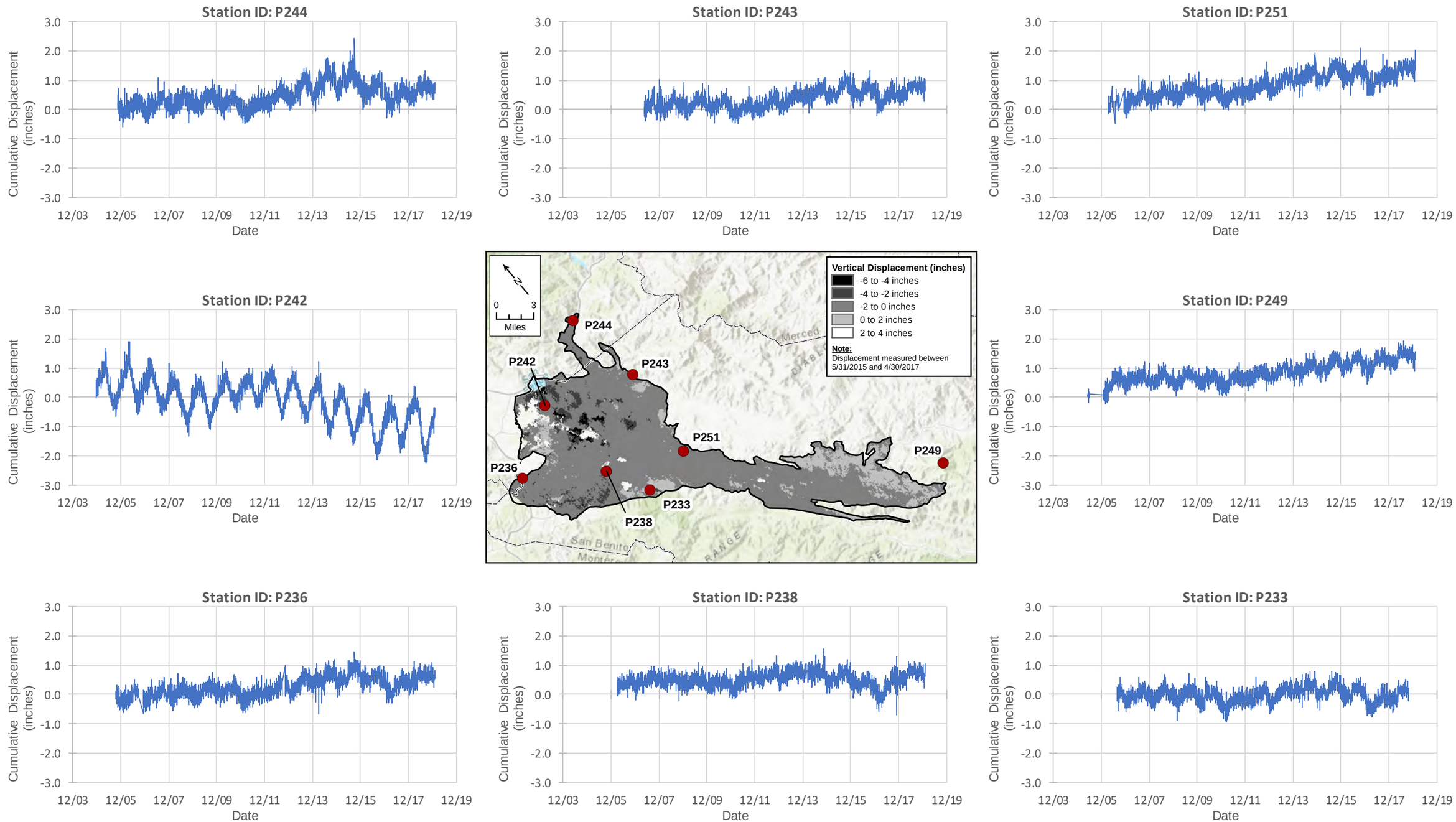
North San Benito Basin

San Benito County

November 2021

TODD GROUNDWATER

Figure 4-13
Ground Surface Elevation Monitoring Stations



UNAVCO Stations

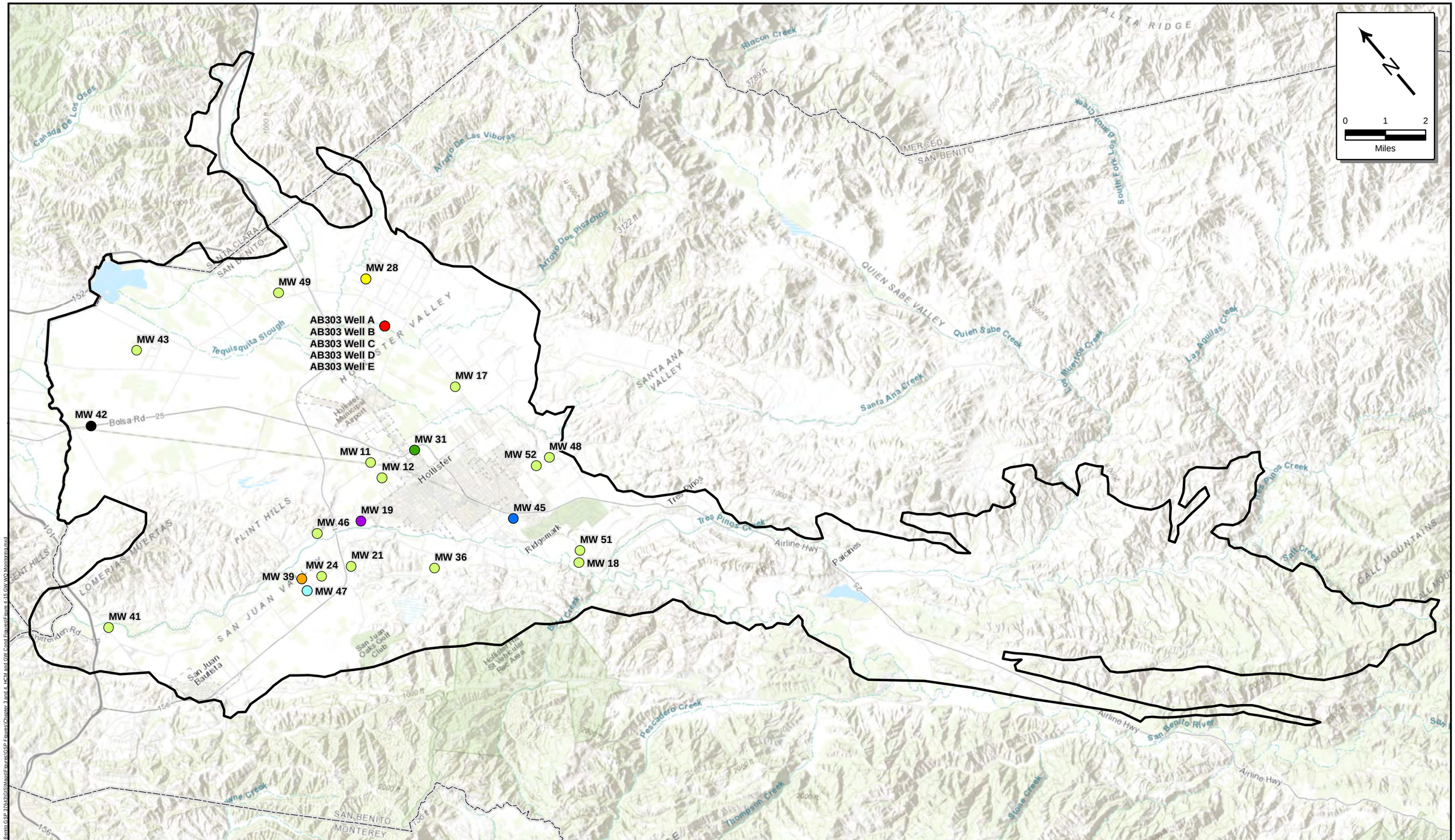
North San Benito Basin

San Benito County

November 2021

TODD GROUNDWATER

Figure 4-14
Historical Ground Surface Elevation from GPS Monitoring



Key Wells

- AB303
- MW 19
- MW 28
- MW 31
- MW 39
- MW 42
- MW 45
- MW 47
- All Other Monitoring Wells

- North San Benito Basin
- San Benito County

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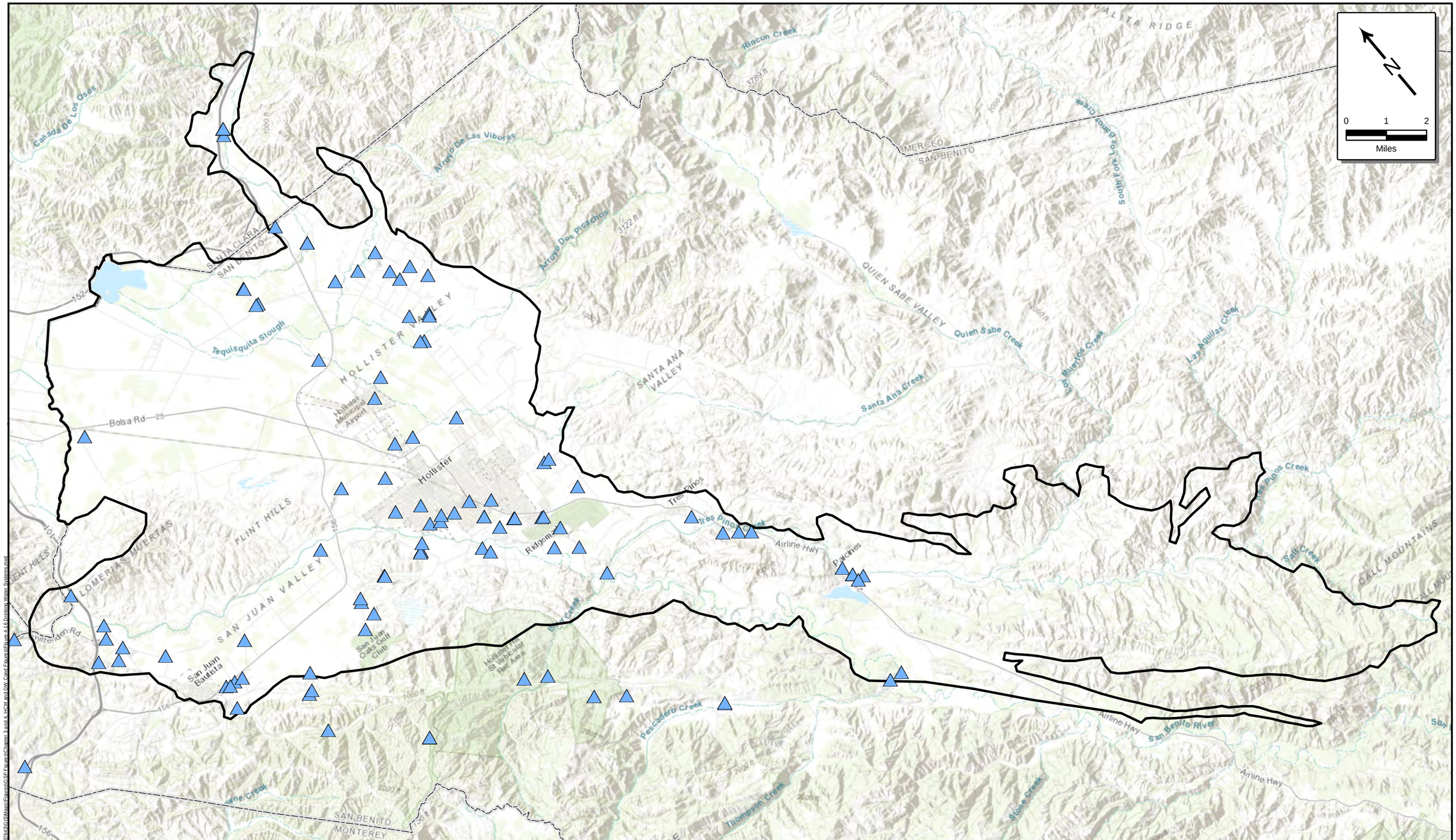
TODD GROUNDWATER

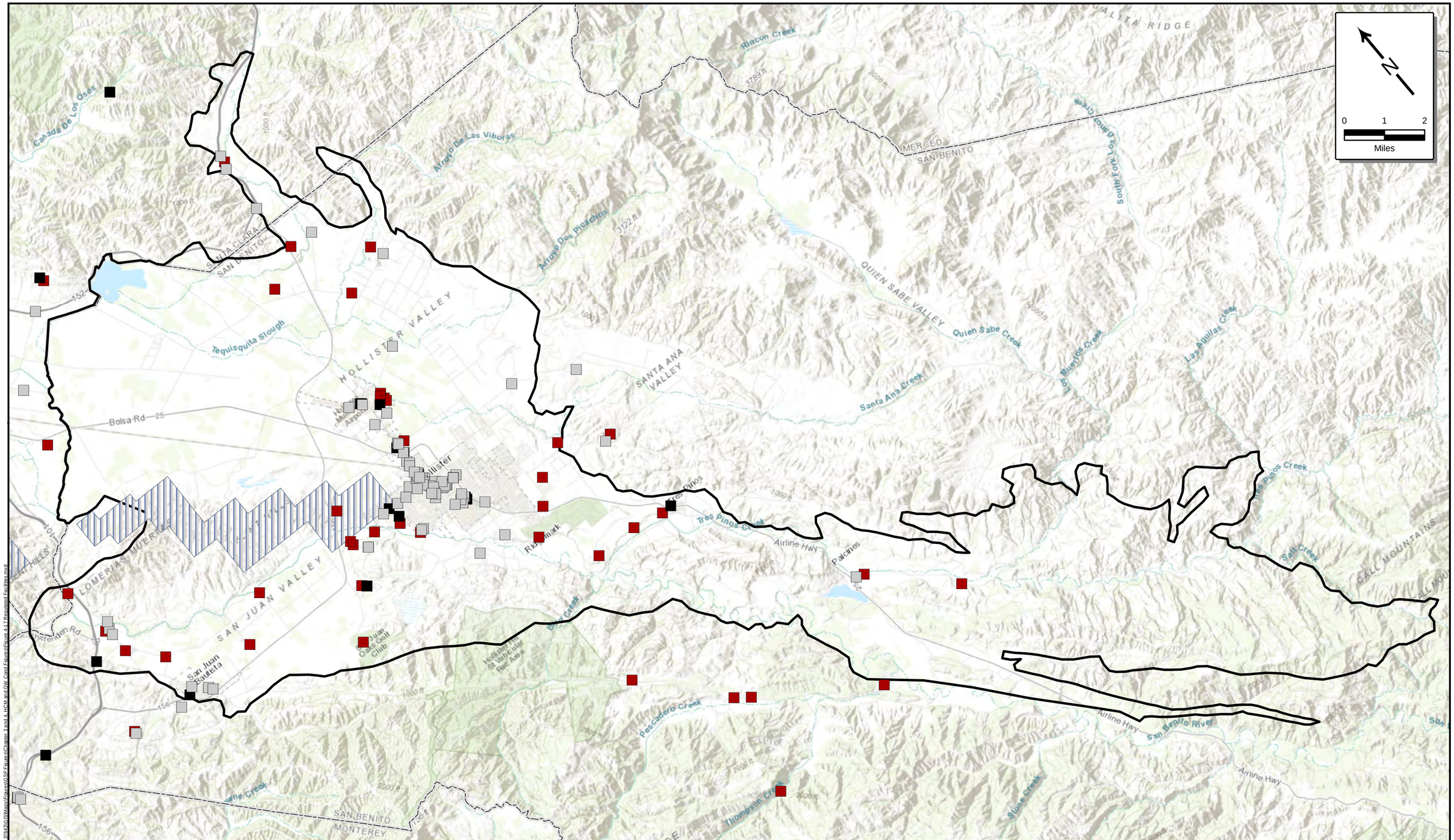
Figure 4-15
SBCWD Water Quality Monitoring Network



November 2021

TODD GROUNDWATER

Figure 4-16
Drinking Water Systems



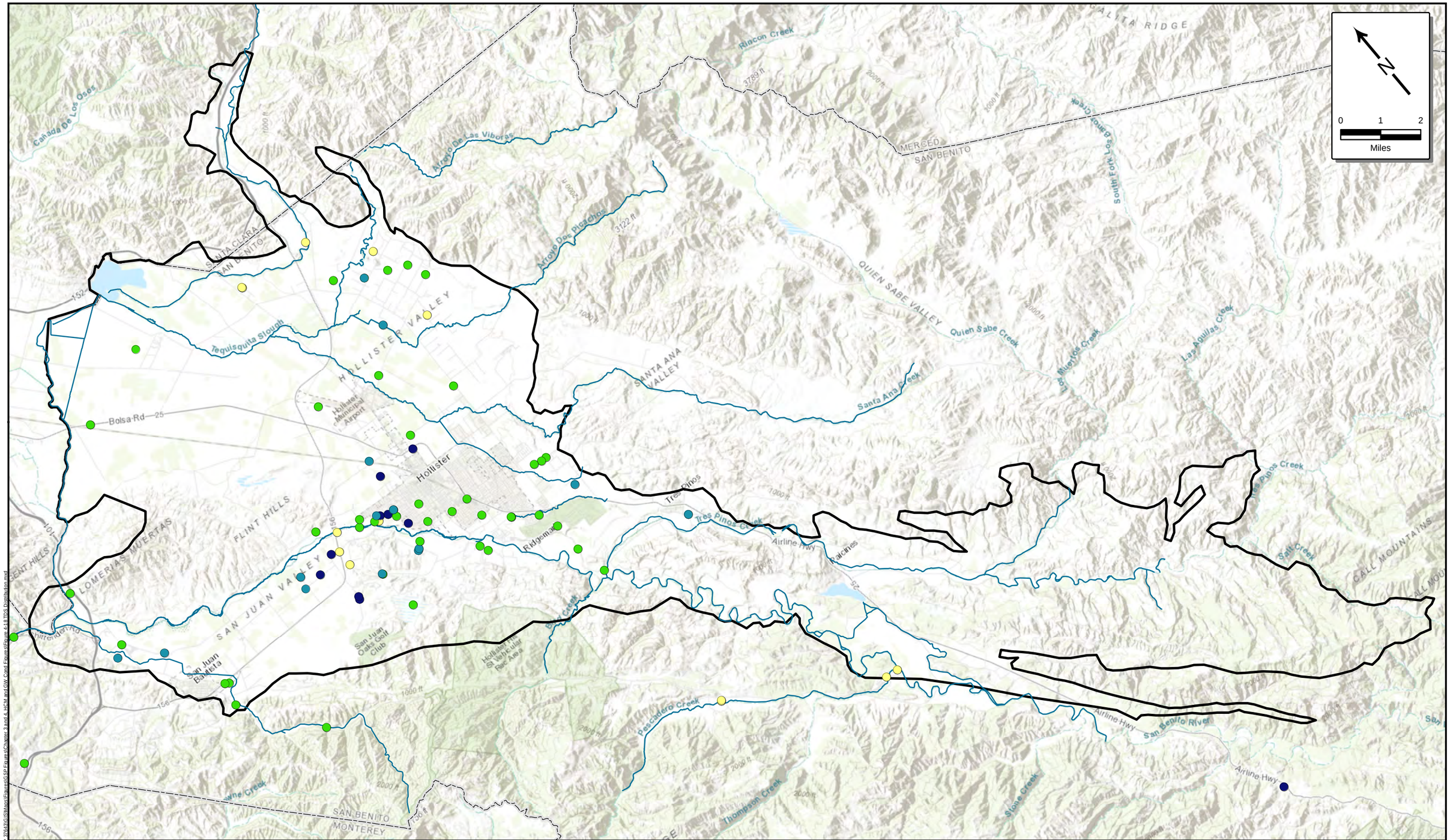
Regulated Facilities (Status)

- Open / Active
- Closed / Inactive
- Other
- Oil / Gas
- North San Benito Basin
- San Benito County

November 2021

TODD GROUNDWATER

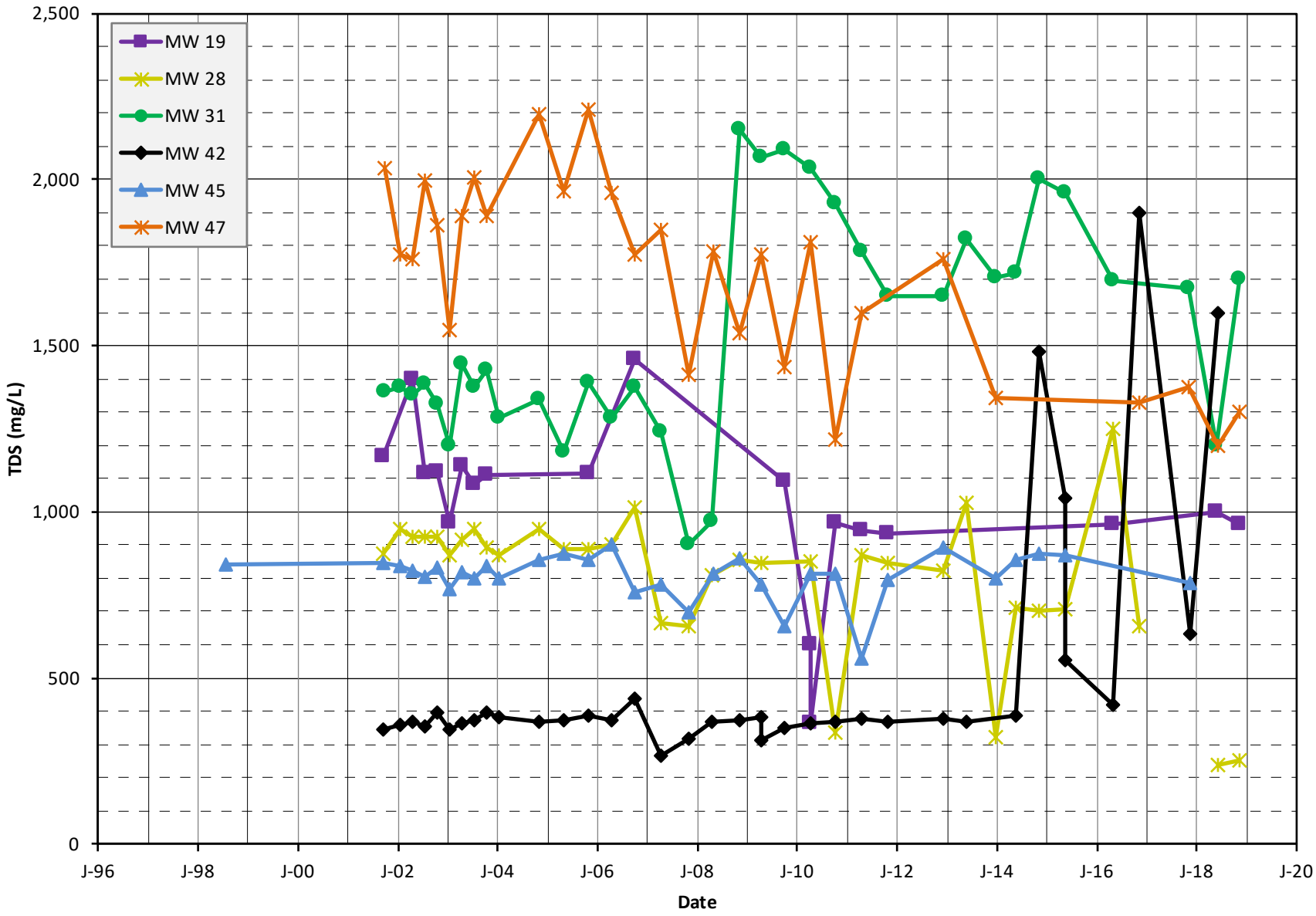
Figure 4-17
Location of Potential Point Sources of Groundwater Contaminants



November 2021

TODD GROUNDWATER

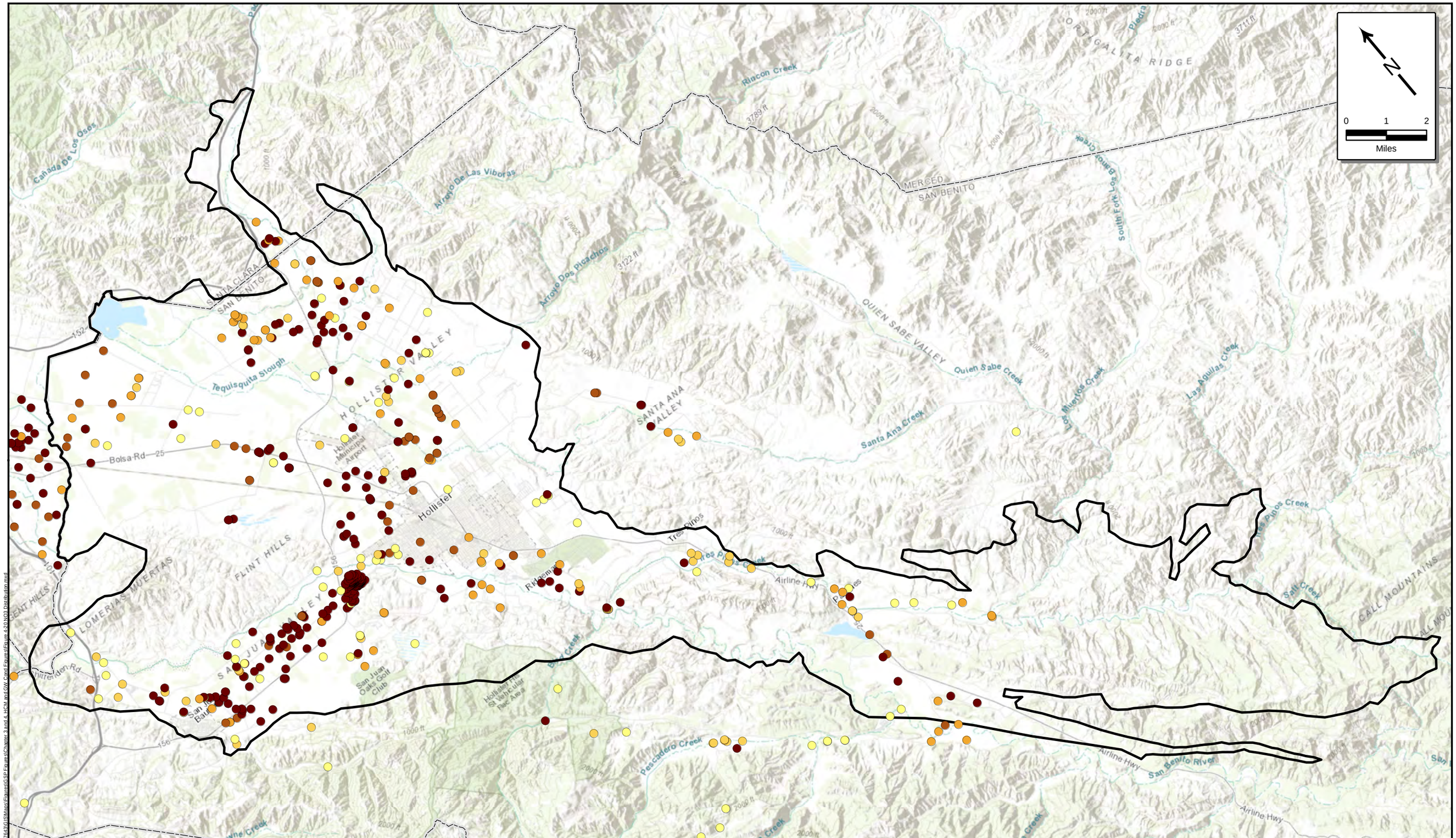
Figure 4-18
Regional Distribution of Total Dissolved Solids
2014-2017



November 2021

TODD GROUNDWATER

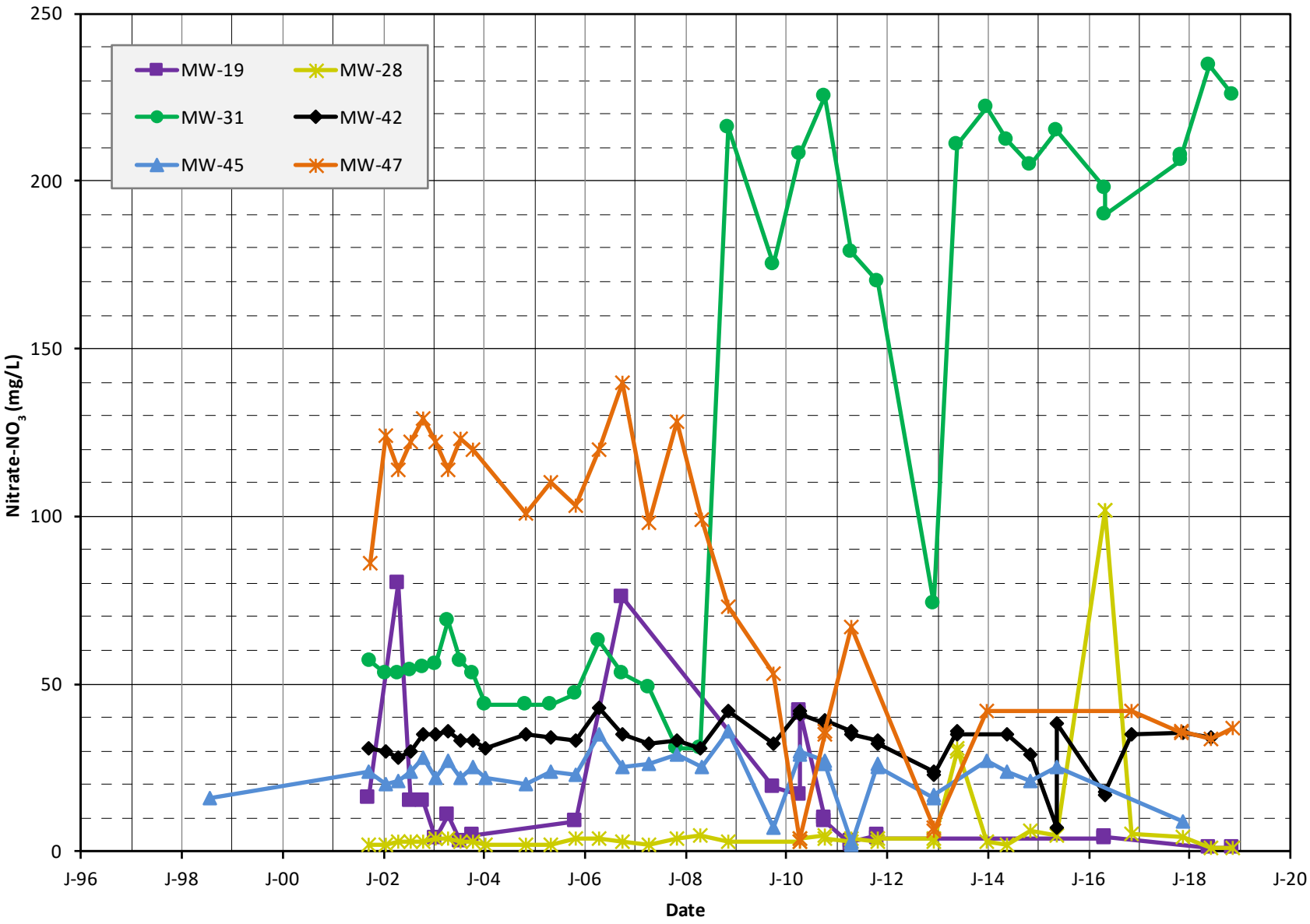
Figure 4-19
Total Dissolved Solids
Regional Trends



November 2021

TODD GROUNDWATER

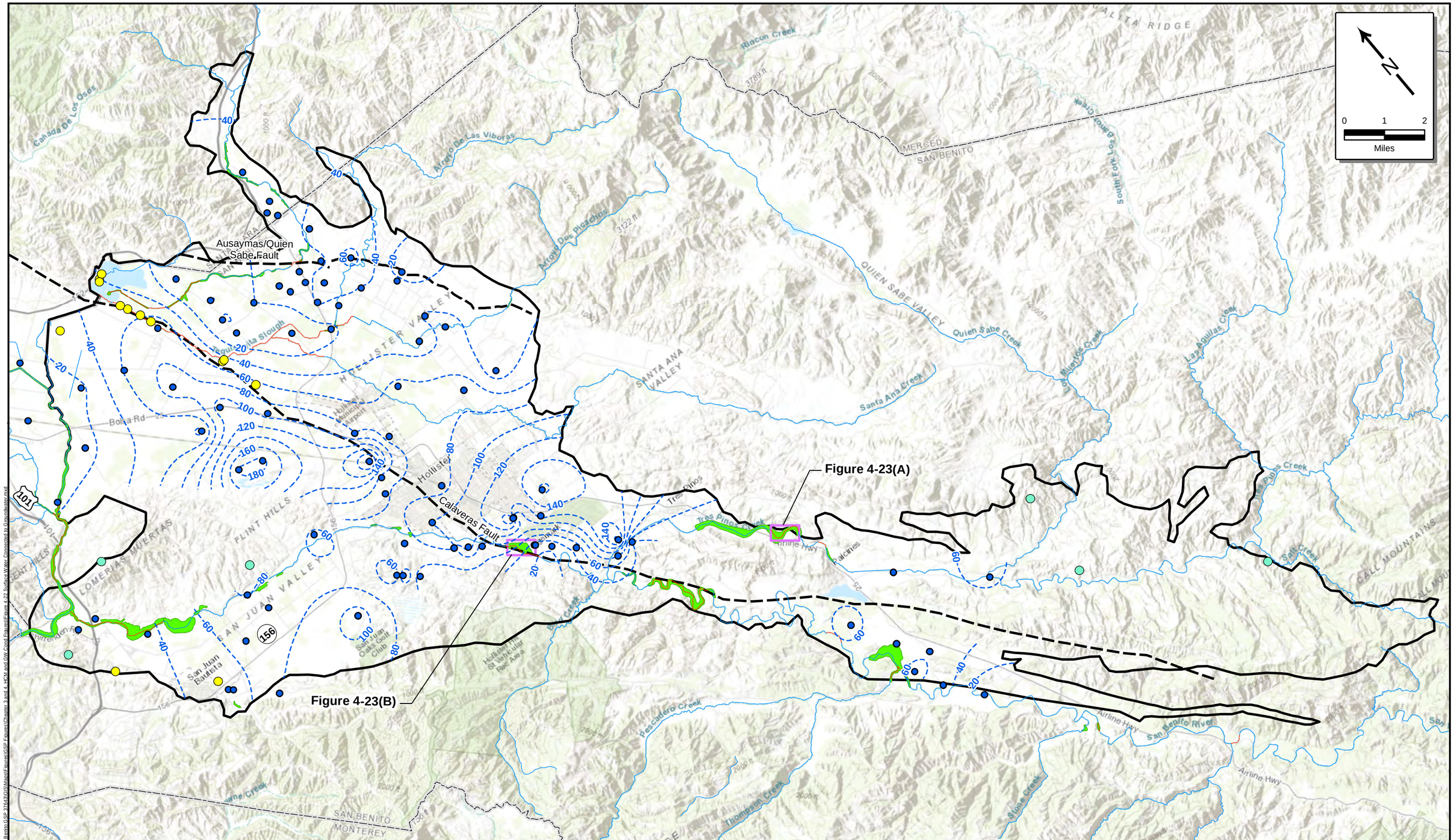
Figure 4-20
Regional Distribution of Nitrate 2014-2017



November 2021

TODD GROUNDWATER

Figure 4-21
Nitrate
Regional Trends

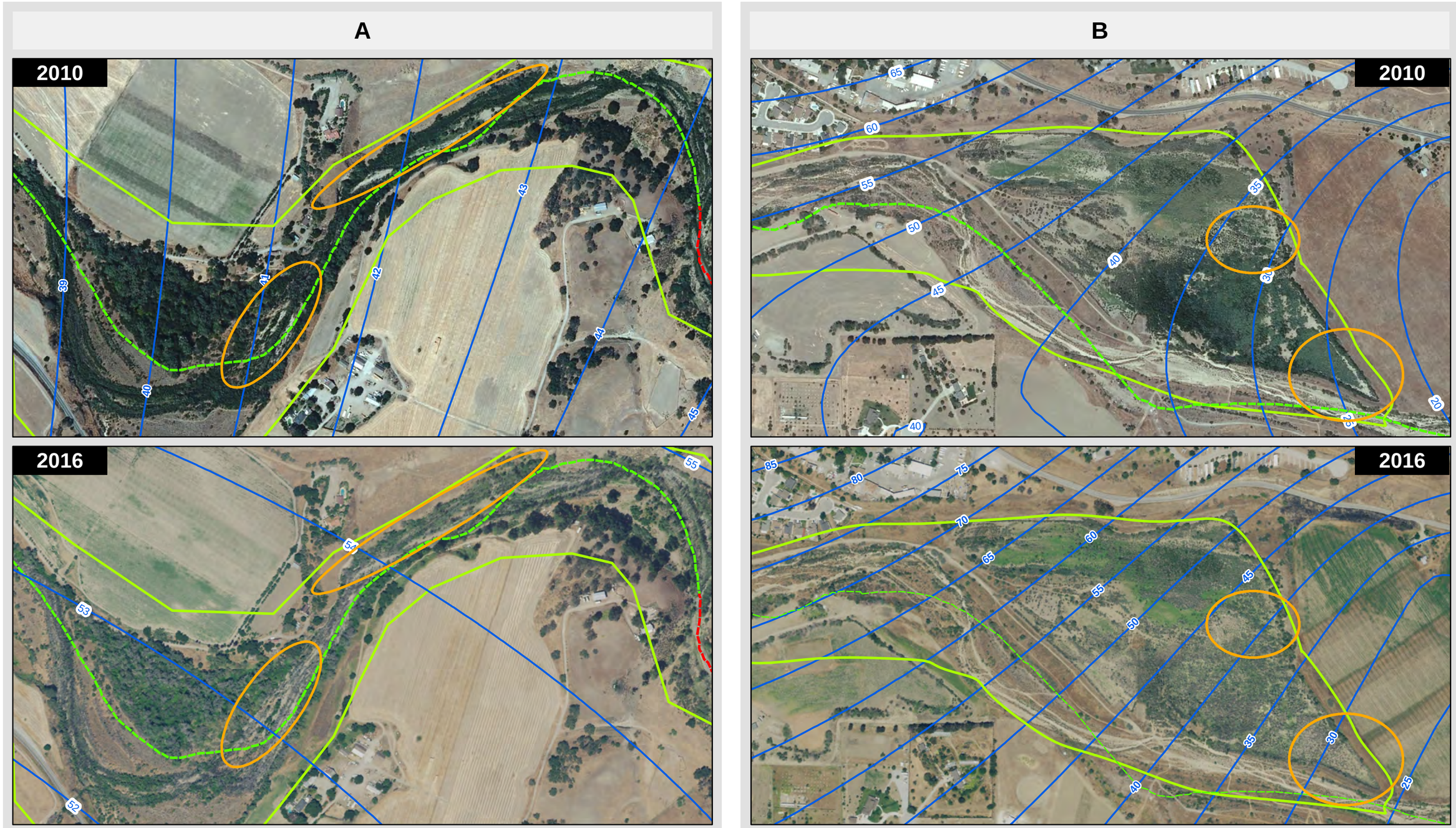


Wetland GDE
Springs and Seeps
Wells
20-foot depth to groundwater contour, feet below ground surface
Generalized Faults
Gaining Stream Reach
Losing Stream Reach
Phreatophytic Riparian Vegetation
Figure 4-23 Bounding Box
North San Benito Basin
San Benito County

November 2021

TODD GROUNDWATER

Figure 4-22
Surface Water Connected to Groundwater



Stream
- Gaining Reach
- Losing Reach

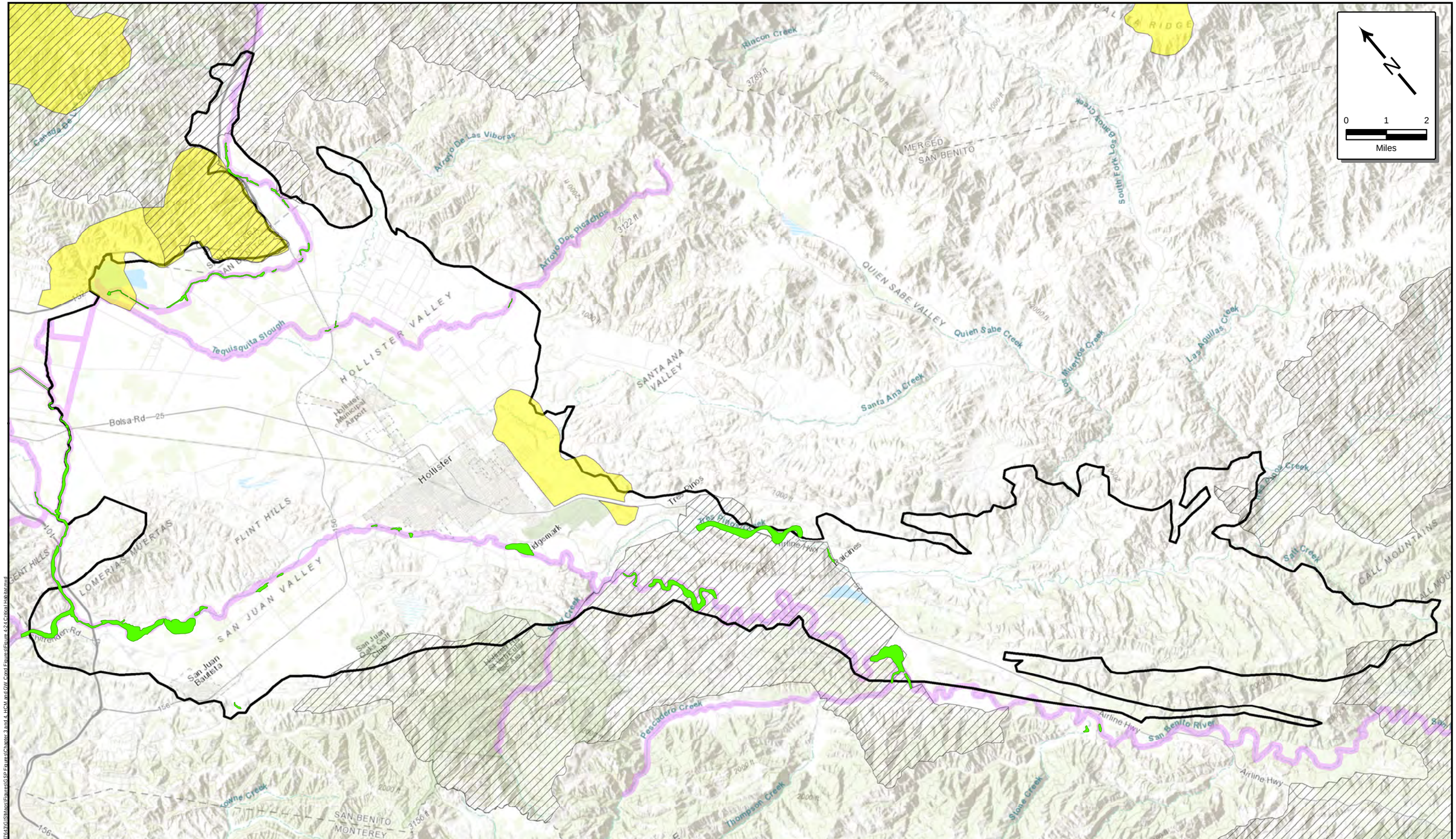
- Depth To Groundwater Contour
- Phreatophytic Riparian Vegetation
- Locations of decreased vegetative cover

November 2021

TODD GROUNDWATER

Figure 4-23
Vegetation Response to Drought Conditions

Path: P:\Projects\San Benito PSB 2764\GIS\Maps\Figures\GSP Figures\Chapter 3 and 4 HCM and GW Cond Figures\Figure 4-23 Vegetation Response to Drought Conditions.mxd



Steelhead Passage Stream
California Tiger Salamander
California Red-Legged Frog
Phreatophytic Riparian Vegetation
North San Benito Basin

November 2021

TODD GROUNDWATER

Figure 4-24
Critical Habitat Areas

5. WATER BALANCE

This section provides a quantitative assessment of the water balance (or water budget) of the North San Benito Subbasin (or Basin), including estimates of inflows and outflows for individual Management Areas (MAs). Annual balances based on historical data are presented for water years 1975-2017, and average annual balances are presented for three intervals within that period. Water balances under future conditions were simulated for an 86-year period corresponding to hydrologic conditions during water years 1922-2007. Methods of analysis are summarized below. Findings are presented in terms of surface water balances, groundwater balances, and cumulative change in groundwater storage. Sustainable yield is also discussed.

This water balance has been developed based on the numerical model. It builds on water balances previously prepared for the Annual Groundwater Reports (see **Appendix F**), but some water balance elements differ from previous estimates. This reflects not only the use of currently available data for the entire North San Benito Basin, but also the fact that the numerical model allows a dynamic and comprehensive quantification of the water balance wherein all estimated water balance elements fit together and are calibrated to groundwater level changes over time. Accordingly, the numerical model is the best tool to quantify the North San Benito water balance. It will be updated regularly through the Groundwater Sustainability Plan (GSP) process, providing a better understanding of the surface water-groundwater system and a tool to evaluate future conditions and management actions.

5.1. WATER YEAR TYPE

GSP Regulations require quantification of the water budget by water year type, which is a classification based on the amount of annual precipitation in a basin. **Figure 5-1** shows annual rainfall in Hollister from water year 1922 through 2018; the average annual amount is 13.4 inches. Water year type is intended to aid in the evaluation of information such as water level hydrographs and groundwater storage changes. **Table 5-1** documents the classification developed for North San Benito, which describes five water year types (critically dry, dry, normal, above normal, wet). The methodology for defining the water year types is based on the California Department of Water Resources (DWR) Water Budget Best Management Practice (BMPs) Document (DWR, 2016b). For North San Benito, the annual rainfall amounts in Hollister over the period of record (1922-2018) were expressed as percentages of average annual rainfall. These were then sorted into quintiles, reflecting the five categories. The sorting into quintiles resulted in the classification shown in **Table 5-1**. The water years from 1922 to 2018 were then classified using the numeric values in **Table 5-1** as illustrated in **Figure 5-1.**

The water year classification is based on local Hollister rainfall as representative of the Basin and surrounding watershed. Local precipitation is important for the overall water balance of the area. While Central Valley Project (CVP) allocations are critical to avoiding overdraft and are based on precipitation patterns in the Sierra Nevada and Central Valley, local precipitation has a larger effect by volume on the groundwater basin. Surface water recharge, deep percolation, and irrigation demand are all dependent on local rainfall.

Table 5-1. Water Year Type Classification

Water Year Type		Range of percent normal	Precipitation Range (in)
Wet	W	>130	> 17.5
Above Normal	AN	105-130	14.1 – 17.5
Normal	N	85-105	11.4 – 14.1
Dry	D	70-85	9.4 – 11.4
Critically Dry	C	<70	< 9.4
Average Rainfall 13.4 inches per year			

5.2. Water Balance Analysis Periods

GSP Regulations require evaluation of the water balance over historical, current, and future periods. The historical period must include ten recent years at a minimum and the future involves projection of 50 years of historical hydrologic conditions. For the Basin, the historical period for water balance analysis is defined over water years 1975 – 2014 and is subdivided into two distinct historical periods. These periods were selected on the basis of cumulative departure of annual precipitation in Hollister during water years 1922-2018, on land use changes, and on availability of imported CVP water. While recognizing that CVP water is not directly available to all MAs, it has been critical to the water balance of the Basin as a whole. Hence two historical periods have been defined plus current and future periods, as described below:

- **Pre-CVP Historical (1975-1988)** – The Pre-CVP Historical period represents the period before CVP water was imported into the basin. Groundwater (with some replenishment by local surface water) was the sole water supply. The average annual precipitation was close to the long-term average, at 114 percent of normal.
- **Historical Recovery (1989-2014)** – The Historical Recovery period is marked by the beginning of CVP imports to supplement groundwater. While having direct effects only on Hollister and San Juan MAs, CVP supply was critical to basin-wide recovery. The average annual precipitation was close to the long-term average, at 102 percent of normal.
- **Current (2015-2017)** – The Current period is a snapshot view of recent conditions as required by Sustainability Groundwater Management Act (SGMA) regulations. Future annual reports will examine changes that have occurred since 2015. This relatively brief period included a dry, above normal, and wet year. The average annual precipitation over those three years (16.28 inches) was 121 percent of the long-term average.
- **Future (2018-2068)** – The Future period represents conditions expected to occur over the next 50 years. The "future baseline" simulation of this period spans an 86-year period corresponding to hydrologic conditions during water years 1922-2007. Two intervals totaling 50 years were selected from that overall period as the basis for calculating average annual future water balances. This process is described in greater detail in Section 5.4.3. In general, the future baseline simulation assumes a continuation of existing land use, urban water demand, water, and wastewater treatment and CVP availability.

5.3. Management Areas (MA)

As defined in the GSP Regulations, an MA is an area within a basin for which the GSP may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors. The Basin has been divided into four MAs, as described in the Definition of Management Areas for North San Benito Basin GSP technical memorandum, included in **Appendix E** to the GSP. The four MAs – Southern, Hollister, San Juan, and Bolsa are shown in **Figure 5-2** and briefly described below.

5.3.1. Southern Management Area

The Southern MA is characterized by uplands and small valleys along the San Benito River and Tres Pinos Creek. Land uses are predominantly rural residential, rangeland, and agricultural (mostly truck crops and vineyards), which rely on groundwater supply provided mostly by private wells.

A key factor differentiating the Southern MA from the other MAs is access to local surface water and the absence of effects of CVP water. Pumping in the Southern MA is also distant from the adjoining Hollister MA. Most of the pumping is in Paicines and Tres Pinos Creek Valleys, which are separated from the Hollister MA by three miles of rugged terrain where there is little pumping. Groundwater in Southern MA is recharged in part by releases from Hernandez and Paicines reservoirs.

5.3.2. Hollister Management Area

The Hollister MA includes the Hollister Valley and adjacent uplands mostly to the south. The Hollister MA differs from the adjoining MAs because of its variety of land uses, multiple jurisdictions, and multiple sources of water supply. Its boundary with the Bolsa and Southern MAs follows the boundary of Zone 6. The boundary with the San Juan MA—which includes part of Zone 6—crosses the narrow point in the valley floor at the upstream end of the San Juan Valley and traces the topographic divides on either side of the gap. The Hollister Valley includes intensive agriculture, rangeland, rural residential, urban, and industrial land uses. The MA includes all or portions of the City of Hollister, Sunnyslope County Water District, Pacheco Pass Water District, Tres Pinos County Water District, Hollister Hills SVRA, and the part of Pacheco Creek Valley that extends north into Santa Clara County.

Sources of water supply include local groundwater (recharged in part by releases from Hernandez and Paicines reservoirs to the San Benito River and releases from Pacheco Reservoir to Pacheco Creek), CVP imported water, and recycled water. A small amount of CVP water also is provided by Valley Water to a few customers in Santa Clara County parts of the MA. Production wells include irrigation, domestic, and public water supply wells throughout the MA, but well density is greater in the northern half of the MA. Domestic wells are relatively dense along Fairview Road, with minimum well depths less than 150 feet.

5.3.3. San Juan Management Area

The San Juan MA includes the San Juan Valley and adjacent uplands. Important characteristics of the San Juan MA are the various land uses, multiple jurisdictions, and multiple sources of water supply. The San Juan Valley is characterized by prime farmland and intensive agriculture, while the uplands are mostly rangeland with some rural residential and industrial land uses. The MA includes most of the City of San Juan Bautista and small areas of the City of Hollister, Aromas Water District, and Santa Clara County. Sources of water supply include local groundwater (recharged in part by releases from Hernandez and

Paicines reservoirs) and CVP imported water. The MA differs from the Hollister MA primarily because of a much higher proportion of agricultural land and water use, generally poorer groundwater quality, and an absence of recycled water use.

Irrigation wells are most numerous along the axis of the valley, while domestic wells are most numerous in the vicinity of San Juan Bautista and toward Aromas on the west, where the highest densities and shallowest wells have been documented by DWR.

5.3.4. Bolsa Management Area

The Bolsa area has long been recognized for its distinct topography and groundwater conditions (e.g., Clark, 1924), although its boundaries have been defined variously by USGS, DWR, and SBCWD. As shown in **Figure 5-2,** the Bolsa is a predominantly flat, relatively low-elevation area. It shares a watershed boundary with the San Juan MA and the Zone 6 boundary with the Hollister MA. It is the only MA bounding another groundwater basin, the Llagas Subbasin in Santa Clara County. It also differs from the adjacent Hollister and San Juan MAs by not having direct access to CVP imports or managed recharge from Hernandez and Paicines Reservoirs.

Important characteristics of the Bolsa MA include the predominantly agricultural and rural land uses and complete reliance on groundwater supply provided by private wells. The Bolsa MA includes the Pajaro River Wetland Mitigation Bank (see Figure 2-1), which includes about 273 acres of lands; the amount of water use is not known.

5.4. METHODS OF ANALYSIS

Complete, itemized surface water and groundwater balances were estimated by combining raw data (rainfall, stream flow, municipal pumping, wastewater percolation) with values simulated using models[4]. Collectively, the models simulate the entire hydrologic system, but each model or model module focuses on part of the system, as described below. In general, the models were used to estimate flows in the surface water and groundwater balances that are difficult to measure directly or that depend on current groundwater levels. These include surface and subsurface inflows from tributary areas, percolation from stream reaches within the Basin, groundwater discharge to streams, subsurface flow from the Llagas Subbasin and between Management Areas, the locations and discharges of flowing wells, consumptive use of groundwater by riparian vegetation, and changes in groundwater storage.

5.4.1. Rainfall-Runoff-Recharge Model

This Fortran-based model simulates hydrologic processes that occur over the entire land surface, including precipitation, interception[5], infiltration, runoff, evapotranspiration, irrigation, effects of impervious surfaces, pipe leaks in urban areas, deep percolation below the root zone, and shallow groundwater flow to streams and deep recharge. The model simulates these processes on a daily time step for 2,768 “recharge zones” delineated to reflect differences in physical characteristics as well as basin and jurisdictional boundaries. The recharge zones cover the entire watershed tributary to the

[4] Water balance values are shown to nearest acre-foot to retain small items, but entries are probably accurate to only two significant digits.

[5] Interception refers to precipitation that does not reach the soil, but instead falls on (and is intercepted by) plant leaves, branches, and plant litter, and is subject to evaporation loss.

groundwater basin except the San Benito River watershed south of the Southern MA. Simulation of watershed areas outside the Basin provided estimates of stream flow and subsurface flow entering the Basin. San Benito River inflow to the Southern MA was obtained directly from stream gauge data. Daily simulation results were subtotaled to monthly values for input to the groundwater model. Additional details regarding the rainfall-runoff-recharge model can be found in **Appendix G**.

5.4.2. Groundwater Model

A numerical groundwater flow model of northern San Benito County was originally developed in 2002 and previously updated in 2015 (Todd Groundwater, 2015). For GSP purposes, the model footprint was expanded to cover the entire Southern MA and all of the Pacheco Creek Valley part of the basin located in Santa Clara County. Also, the simulation period was updated to include water years 1975-2017 and to reflect 2014 land use as mapped by DWR and made available via the SGMA Data Portal website. The model uses the MODFLOW 2005 code developed by the U.S. Geological Survey, with pre- and post-processing facilitated by using Groundwater Vistas, a readily available commercial software package. The model produces linked simulation of surface water and groundwater, as described below. **Figure 5-3** shows the modeled area and key features. Additional documentation of the model update and recalibration is provided in **Appendix G**.

5.4.2.1. Surface Water Module

The stream flow routing module of MODFLOW simulates flow in creeks and rivers that cross the groundwater Basin (see **Figure 5-3**). Surface flow in these streams where they enter the Basin is provided by the user (from gauged flows or the rainfall-runoff-recharge model), and the flow is routed across the Basin from reach to reach. Each model grid cell traversed by a creek or river corresponds to a reach. Along each reach mass balance is conserved in the stream, including inflow from the upstream reach and tributaries, inflow from local runoff and CVP discharges, head-dependent flow across the stream bed to or from groundwater, and outflow to the next downstream reach. Flow across the stream bed is a function of the wetted channel length and width, the bed permeability and the difference in elevation between the stream surface and groundwater at the reach cell. Wetted width and depth of the stream are functions of stream flow.

5.4.2.2. Groundwater Module

MODFLOW simulates subsurface flow by combining equations representing flow through porous sediments (the Darcy Equation) with equations that enforce conservation of mass. The equations are implemented numerically, which means they are applied simultaneously between all adjoining cells in a model grid through an iterative process. Dispersed recharge to the top layer of the model grid from deep percolation of rainfall, irrigation water and pipe leaks is obtained from the rainfall-runoff-recharge model. Bedrock inflow is also obtained from that model and simulated as a series of injection wells around the periphery of the Basin. Percolation at wastewater treatment plants is similarly simulated as shallow injection wells in model cells at the wastewater pond locations. Irrigation pumping is estimated for each recharge zone by the rainfall-runoff-recharge model and assigned to the groundwater model cell closest to the center of the recharge zone. Evapotranspiration (ET) by riparian vegetation is simulated using the MODFLOW EVT module, which allows the ET rate to decrease as the water table drops to the bottom of the root zone. Where flowing wells are present during periods of relatively high groundwater levels, MODFLOW drain cells are used to cap the simulated water levels at the ground surface elevation. Groundwater inflow from the Llagas Subbasin is simulated as a function of cell cross-sectional area, permeability, and water-level difference between the cell and the estimated external

groundwater level (estimated from measured water levels near the southern boundary of the Llagas Subbasin).

5.4.3. Simulation of Future Conditions

GSP regulations §354.18(c)(3) require simulation of several future scenarios to determine their effects on water balances, yield, and sustainability indicators. The following three scenarios are prescribed:

> **Future Baseline.** This represents a continuation of existing land and water use patterns, imported water availability, and climate.
>
> **Climate Change.** This represents a continuation of existing land and water use patterns, but with anticipated effects of future climate change on local hydrology (rainfall recharge and stream percolation) and on the availability of imported water supplies.
>
> **Growth.** This scenario implements anticipated changes in land use and associated water use, such as urban expansion, new irrigated areas, and changes in crop types.

Each of these scenarios must cover a 50-year period. The groundwater model used to evaluate historical conditions simulates a 43-year period (water years 1975-2017). To obtain 50 years of analysis, future simulations were completed as back-to-back simulations of two 43-year periods: water years 1922-1964 and 1965-2007. This period takes advantage of DWR's CalSim2 simulations of CVP availability, which cover the period 1922-2003. It also includes the two largest droughts in the historical record: 1923-1935 and 1987-1992. Except for water quality, undesirable results for all sustainability indicators are most common and/or most severe during droughts.

The simulations produce 86 years of simulated water levels and water balances. For GSP compliance average water balances were calculated for the combined periods of 1922-1953 and 1982-2002, which together total 50 years. Two periods were selected instead of a single continuous period in order to include the two large droughts. The specific date windows were selected on the basis of cumulative departure graphs of Hollister precipitation and CVP availability, which are shown in **Figures 5-4 and 5-5**, respectively. For both metrics, the early period was drier than average, and the late period was wetter. When combined, average precipitation and CVP availability were within 3 percent of their long-term averages.

The following paragraphs describe how hydrologic data and model input assumptions were developed for the future baseline scenario. Preparation and results of the climate change and growth scenarios are described in Section 8 Projects and Management Actions. Specific assumptions and data included in the future baseline simulation are as follows:

- Initial water levels are simulated water levels for September 2012 from the historical calibration simulation. That year represents relatively recent, non-drought conditions.
- Land use remains the same as existing conditions. In the model these are represented by 2014 land use mapped by remote sensing methods and obtained from DWR.
- Daily precipitation in Hollister was estimated back to 1922 based on correlations with gauged precipitation in Gilroy, Watsonville, and Salinas. Daily ETo was estimated by adjusting the average ETo for each calendar month to reflect historical daily temperatures, using regressions of temperature and ETo for each calendar month.

- Small stream inflows and bedrock inflow were simulated for 1922-2007 using the rainfall-runoff-recharge model from the historical simulation, with existing land use and the above daily time series of precipitation and ETo.
- Monthly outflow from the existing Pacheco Reservoir to Pacheco Creek during 1922-2003 was simulated assuming that winter inflows are stored up to the 5,500 AF capacity of the reservoir and released during June-September at 15 cfs, as long as sufficient water remains to supply those releases.
- San Benito River inflow at the model boundary for 1922-1974 was reconstructed using simple rainfall-runoff and reservoir operations models. Linear relationships between Hollister rainfall and flows at the gauge near Willow Creek School (near the model boundary) were developed for 1941-1961, which was the period of record prior to construction of Hernandez Reservoir. In the reservoir operations model, simulated runoff from the part of the watershed tributary to the Hernandez Reservoir site was stored in winter up to the reservoir capacity of 17,500 AF and released at 50 cfs from June through August as long as water was still available. The releases (and winter spills) were combined with runoff from the unregulated part of the watershed to obtain estimated flows at Willow Creek School. This implicitly assumed that Hernandez Reservoir will be operated as it was in the past.
- Municipal and Industrial (M&I) and rural domestic pumping were assumed to remain at existing levels. Those were obtained by calculating average pumping for each calendar month during 2015-2017 and applying those averages in every year of the future baseline simulation. This implicitly assumes no growth in those water use categories.
- Wastewater percolation and recycled water use for irrigation were assumed to remain at existing levels and were calculated using the same procedure as for M&I and domestic pumping.
- Monthly delivery of CVP water was obtained from DWR's CalSim2 operations model, which produces simulated allocations for south-of-Delta contractors. The CalSim2 simulation applied existing CVP operational rules and 2030 climate conditions in CVP source areas. For GSP purposes, actual use of CVP M&I water by the City of Hollister and Sunnyslope County Water District was set equal to the smaller of 1) the CalSim2 M&I allocation, 2) the combined capacity of the Lessalt and West Hills water treatment plants (approximately 5,900 AFY), or 3) the amount of CVP water needed to achieve a 70 percent / 30 percent blend of CVP water and groundwater. Other CVP M&I users were assumed to use 1,500 AFY (which is the recent historical usage) and be reduced by the same proportion as the two municipal water purveyors in years when the CVP allocation could not meet the normal demand. In the modeling, surplus CVP M&I water in wet years was transferred to agricultural use, although in practice it would likely be percolated to groundwater. Agricultural users were assumed to always accept all of the CalSim2 agricultural water allocation.

Simulated future baseline water balances for the Management Areas are presented in the next sections, where they are compared with historical and current water balances. Simulated groundwater levels are compared with simulated water levels for other future scenarios in Section 8 Projects and Management Actions.

5.5. Surface Water Balance

This section describes and quantifies the water balance of creeks and rivers that cross the Basin. All significant inflows to and outflows from these surface water bodies are included in the water balance. The surface water balance shares two flows in common with the groundwater balance: percolation from

surface water to groundwater and seepage of groundwater into surface water. Each of these is an outflow from one system and an inflow to the other.

Annual surface water balances during 1975-2017 were compiled from monthly data for each Management Area. Average annual water balances for each Management Area during each of the four analysis periods are presented in Section 5.5.3. Annual basin wide surface water balances for 1975 to 2017 are shown in **Figure 5-6** and demonstrate how most of the surface water volume simply passes through the Basin.

Change in surface water in storage is not included in water balance tables. Local surface water is stored in Hernandez and Paicines Reservoirs, and CVP water is stored locally in San Justo Reservoir. Those facilities are used primarily to buffer seasonal fluctuations in supply and demand. Over periods of years—such as the water budget analysis periods—the net change in storage in the reservoirs is very small compared to the annual inflows and outflows. Accordingly, the net change is storage has been omitted from the tables.

5.5.1. Inflows to Surface Water

5.5.1.1. Precipitation and Evaporation

Precipitation and evaporation on the land surface are accounted for in the rainfall-runoff-recharge model. Those processes are not included in the surface water balances, which address only water in stream channels and imported water. Also, precipitation and evaporation on the surface of creeks and rivers is invariably a miniscule percentage of total stream flow. These small fluxes are not included in the surface water balances.

5.5.1.2. Tributary Inflows

Tributary inflows are the flows in creeks where they enter the Basin. With two exceptions, these flows are obtained from the rainfall-runoff-recharge model and passed to the surface water module of the groundwater flow model. The two exceptions are Pacheco Creek and the San Benito River, both of which have flows that are regulated by reservoir operation. For the historical and future baseline simulations, inflows to Pacheco Reservoir generated by the rainfall-runoff-recharge model were assumed to be stored in winter up to the 5,500 AF reservoir storage capacity and released at 15 cfs during June-September or until the reservoir was emptied, whichever occurred first. For the historical simulation of the San Benito River, inflows at the model boundary were set equal to measured flows at the gauge near Willow Creek School. Those flows reflect actual historical operation of Hernandez Reservoir. For the future baseline simulation, 39 percent of the simulated runoff for the entire watershed upstream of the model area was assumed to be regulated by Hernandez Dam. Inflow in winter was stored up to the 17,500 AF storage capacity of the reservoir and released during June-August at a rate of 50 cfs as long as sufficient storage was available to do so.

Stream flows entering one Management Area from another Management Area are itemized separately so the magnitude of discharge from local tributaries can be compared with the amount of water flowing through the Management Area in major creeks and rivers.

5.5.1.3. Valley Floor Runoff

Valley floor areas are flatter than the tributary watersheds, and the amount of runoff per acre is consequently smaller. The rainfall-runoff-recharge model simulates runoff from valley floor areas, and those flows are added to the inflows of nearby stream segments in the groundwater model.

5.5.1.4. CVP Imported Water

Two Management Areas (Hollister and San Juan) receive imported water from the CVP, which is delivered to municipal and agricultural users and formerly was also percolated in local streams to enhance groundwater recharge. Little of the imported water delivered to customers ends up in the stream network, given that efficient irrigation practices and urban water conservation are widespread and provide little opportunity for losses to streams. CVP imports are included in the water balances to provide a complete picture of surface water resources that are being or could potentially be harnessed to meet local water demands.

Annual deliveries of CVP are shown in **Figure 5-7**. Deliveries of imported water began in 1988 serving almost exclusively agricultural customers. During 1988-2001, substantial amounts of CVP water were percolated in local creeks to accelerate replenishment of groundwater storage following the 1987-1992 drought and prior decades of overdraft. The recovery effort was successful, and percolation of CVP water was greatly reduced. In 2008, concerns arose over potential introduction of invasive non-native species (zebra mussels) and discharges of CVP water to local creeks were discontinued. A new strategy of percolating CVP water in off-channel ponds was initiated in 2017. Use of CVP M&I water was limited to a few commercial users and small water systems until 2003, when completion of the Lessalt water treatment plant allowed much larger quantities to be treated and included in the City of Hollister water supply. The ability to use CVP M&I water was further increased by the West Hills water treatment plant, which became fully functional in 2017. In 2018, use of M&I water totaled 5,769 AF, or 70 percent of the maximum allocation. The CVP water delivered to growers and urban users reduces the amount of pumping needed to meet their respective water demands. During dry years when CVP allocations are low, groundwater pumping increases; and the opposite occurs in wet years. Thus, conjunctive use of CVP water and groundwater is a central element of local groundwater management.

CVP water is delivered to agricultural customers in the Hollister and San Juan MAs. In many years, agricultural use of CVP water has been limited by its availability. In wet years availability sometimes exceeds the demand. Although CVP water is more expensive than groundwater, it has much better water quality and is delivered with pressure. In 2009, regulatory changes in the CVP system resulted in decreased allocations for imported water. This change combined with drought conditions significantly reduced the amount of CVP imported for agricultural use during 2009-2017.

CVP imported water stored in San Justo Reservoir seeps from the reservoir to the local groundwater. In addition, water evaporates from the surfaces. These seepage and evaporation losses remain consistent through the period of record and are not shown in the surface water balance, although seepage from San Justo Reservoir is included in the groundwater model.

5.5.1.5. Seepage from Groundwater

When the water table elevation near a stream is higher than the water surface of the stream, groundwater will seep through the stream bed and add to streamflow. This flux depends strongly on groundwater elevation and is calculated by the stream flow routing module of the groundwater model.

5.5.2. Outflows of Surface Water

5.5.2.1. Surface Outflow from Management Areas and the Basin

Surface water outflow occurs where creeks and rivers cross the downstream boundary of a management area. For example, Pacheco Creek and Tequisquita Slough cross from the Hollister to the Bolsa MA, and Tres Pinos Creek and the San Benito River cross from the Southern to the Hollister MA.

The ultimate surface water outflow from the Basin is outflow to the Pajaro River at the western end of the San Juan MA. Surface flows at the boundaries between MAs and at the downstream end of the Basin are simulated by the stream flow routing module of the groundwater model.

5.5.2.2. Surface Water Percolation to Groundwater

Percolation from streams to groundwater occurs when the water level in a stream is higher than the nearby water table and is simulated using the same equation used for groundwater seepage into streams. The direction of flow across the stream bed simply depends on whether the stream surface is higher than the water table or vice versa.

5.5.3. Summary by Management Area

5.5.3.1. Southern MA

Table 5-2 summarizes surface water balances for the Southern MA. As shown, tributary watersheds supply almost all surface water inflows to the Southern MA, with the San Benito River watershed contributing about 43 percent of those inflows. Percolation to and from groundwater are both relatively high in this Management Area, primarily because of the long reaches of the San Benito River and Tres Pinos Creek that pass through. The relatively low value of seepage from groundwater into streams during the current period is likely due to delayed recovery of groundwater levels following the 2013-2015 drought. That is, 2017 was very wet in terms of rainfall, runoff, and streamflow, but groundwater levels were still recovering from the drought. Tributary inflows and valley floor runoff were lower in the future baseline simulation than during the three historical periods because average annual rainfall over the 1922-2017 period was less than the averages during each of the three historical periods. This rainfall difference was amplified by the nonlinear relationships between rainfall, runoff, and recharge: for a given percent increase in rainfall, simulated stream flow will increase by a larger percentage.

Table 5-2. Average Annual Surface Water Balances, Southern Management Area (AFY)

	Historical			
Water Balance Items	**Pre-CVP 1975-1988**	**Recovery 1989-2014**	**Current 2015-2017**	**Future[1]**
Surface Water Inflows				
Local watershed inflows	47,603	43,347	44,614	42,061
Valley floor runoff	3,996	3,854	5,509	2,708
Inflow from other MAs	0	0	0	0
CVP imports	*0*	*0*	*0*	*0*
Seepage from groundwater	20,482	18,851	12,911	19,297
Total	**72,081**	**66,053**	**63,034**	**64,066**
Surface Water Outflows				
Outflow from Southern to Hollister MA	(43,840)	(41,599)	(37,478)	(39,540)
Percolation to groundwater	(28,241)	(24,454)	(25,556)	(24,526)
Total	**(72,081)**	**(66,053)**	**(63,034)**	**(64,066)**
Net Inflow				
Inflows (except CVP) - outflows	**0**	**0**	**0**	**0**

1. Average for 1925-1953 and 1982-2002 combined (50 years total).

As shown in the Totals and bottom row of **Table 5-2**, total surface water inflows are equal to total surface water outflows. This reflects the lack of appreciable surface water storage in the MA, even with Paicines Reservoir, such that inflows quickly become outflows relative to the time frames considered here.

5.5.3.2. Hollister MA

As shown in **Table 5-3,** summarizing the Hollister MA surface water balances, local watershed inflows (from Pacheco Creek, Arroyo de las Viboras, Arroyo Dos Picachos, and Santa Ana Creek) are similar to the amount of surface inflow from the Southern MA (Tres Pinos Creek and the San Benito River). Percolation to groundwater decreased and groundwater seepage into surface water increased from the pre-CVP historical to the recovery period because of the rise in groundwater levels as the Basin recovered. Net recharge to groundwater decreased from 31 percent of stream inflows during the pre-CVP historical period to 25 percent during the recovery and current periods. Future tributary inflows and valley floor runoff are smaller than any of the historical and current periods because of less average annual rainfall combined with the nonlinear relationship of runoff to rainfall. Future CVP use is estimated to be similar to use during the recovery period. This reflects SBCWD's increased ability to use more M&I CVP water when it is available (due to the water treatment plants) and the assumption that all agricultural allocations will be accepted and put to use.

As shown in the table, total surface water inflows equal total outflows; this is because of the lack of surface water storage in the Hollister MA.

Table 5-3. Average Annual Surface Water Balances, Hollister Management Area (AFY)

Water Balance Items	Historical		Current	Future[1]
	Pre-CVP 1975-1988	Recovery 1989-2014	2015-2017	
Surface Water Inflows				
Local watershed inflows	46,235	43,596	56,273	33,056
Valley floor runoff	3,397	3,354	4,056	2,721
Inflow from Southern MA	43,840	41,599	37,478	39,540
CVP imports	*784*	*11,963*	*6,801*	*12,308*
Seepage from groundwater	844	2,541	635	2,203
Total	**95,100**	**103,052**	**105,243**	**89,828**
Surface Water Outflows				
Outflow from Hollister to Bolsa MA	(46,803)	(49,961)	(59,370)	(41,736)
Outflow from Hollister to San Juan MA	(17,492)	(16,298)	(10,880)	(14,113)
Percolation to groundwater	(30,021)	(24,831)	(28,192)	(21,671)
Total	**(94,316)**	**(91,089)**	**(98,442)**	**(77,520)**
Net Inflow				
Inflows (except CVP) – outflows[2]	**0**	**0**	**0**	**0**

1. Average for 1925-1953 and 1982-2002 combined (50 years total).
2. CVP imports are not included in the net inflow calculation as most is delivered directly to users.

5.5.3.3. San Juan MA

Table 5-4 summarizes the surface water balances for San Juan MA. As shown, by far the largest item in the San Juan MA water balance is Pajaro River inflow from the Bolsa MA. The river hugs the downstream edge of the Basin with little net exchange with groundwater; almost all of the inflow becomes outflow. The San Benito River is the next largest surface inflow. San Juan Creek inflow is about one-fourth as large, and valley floor and nearby hillside runoff totals about half the San Juan Creek flow. There is a steady decrease in percolation to groundwater and increase in groundwater discharge to streams from each analysis period to the next, probably reflecting long-term recovery of groundwater levels. As in the other MAs, watershed inflows and valley floor runoff are smaller in the future period than in the prior periods because of less average annual rainfall combined with the nonlinear relationship between rainfall and runoff. Future CVP imports are expected to be similar to those during the recovery period due to SBCWD's increased ability to use more M&I CVP water when it is available.

Total surface water inflows equal outflows because of lack of surface water storage in the San Juan MA.

Table 5-4. Average Annual Surface Water Balances, San Juan Management Area (AFY)

Water Balance Items	Historical		Current	Future[1]
	Pre-CVP 1975-1988	Recovery 1989-2014	2015-2017	
Surface Water Inflows				
Local watershed inflows	6,220	6,004	7,950	4,491
Valley floor runoff	2,413	2,240	2,948	1,744
Inflow from Hollister MA	17,492	16,298	10,880	14,113
Inflow from Bolsa MA	51,125	56,768	62,926	43,369
CVP imports	*261*	*4,950*	*2,549*	*4,801*
Seepage from groundwater	80	637	835	1,170
Total	**77,591**	**86,898**	**88,088**	**69,688**
Surface Water Outflows				
Outflow from San Juan MA to Pajaro River	(67,873)	(75,626)	(79,483)	(59,314)
Percolation to groundwater	(9,456)	(6,321)	(6,056)	(5,573)
Total	**(77,329)**	**(81,947)**	**(85,539)**	**(64,887)**
Net Inflow				
Inflows (except CVP) – outflows[2]	**0**	**0**	**0**	**0**

1. Average for 1925-1953 and 1982-2002 combined (50 years total).
2. CVP imports are not included in the net inflow calculation as most is delivered directly to users.

5.5.3.4. Bolsa MA

As shown in **Table 5-5**, the surface water balance of the Bolsa MA is dominated by inflows from the Hollister MA (Pacheco Creek and Tequisquita Slough). The water balance does not include surface inflows from the Llagas Subbasin, which would be large but tend to simply pass through the Bolsa MA as flow in the Pajaro River. Groundwater discharge to streams occurs primarily east of the Calaveras Fault; this increased from the historical to the recovery period as a result of regional recovery of groundwater levels. Discharge was lower during the current period due to drought-depressed groundwater levels and during the future period due to generally drier conditions (less rainfall on average). Lower average annual rainfall in the future scenario resulted in lower values of almost all surface inflows and outflows relative to the three prior periods.

Total surface water inflows equal outflows because of lack of surface storage in Bolsa MA.

Table 5-5. Average Annual Surface Water Balances, Bolsa Management Area (AFY)

Water Balance Items	Historical		Current	Future[3]
	Pre-CVP 1975-1988	Recovery 1989-2014	2015-2017	
Surface Water Inflows				
Local watershed inflows	0	0	0	0
Valley floor runoff[1]	3,603	3,374	4,377	2,347
Inflow from Hollister MA	46,803	49,961	59,370	41,736
CVP imports	0	0	0	0
Seepage from groundwater[2]	4,463	6,293	3,761	2,683
Total	**54,869**	**59,628**	**67,508**	**46,765**
Outflows				
Outflow from Bolsa to San Juan MA	(51,125)	(56,768)	(62,926)	(43,369)
Percolation to groundwater	(3,744)	(2,860)	(4,582)	(3,396)
Total	**(54,869)**	**(59,628)**	**(67,508)**	**(46,765)**
Net Inflow				
Inflows (except CVP) - outflows	**0**	**0**	**0**	**0**

1. For Bolsa MA, valley floor runoff includes runoff from the northern slopes of the Lomerias Muertas and from a small strip of land in the Llagas Subbasin between the Pajaro River and the northwestern model boundary.
2. For Bolsa MA, groundwater discharge to streams includes flow modeled as discharge to hypothetical drains along the lower reaches of Pacheco Creek and Tequisquita Slough.
3. Average for 1925-1953 and 1982-2002 combined (50 years total).

5.6. Groundwater Balance

Annual groundwater inflows and outflows for each Management Area for the entire historical and current model period (1975-2017) are shown as stacked bars in **Figures 5-8** through **5-11**. Inflows are stacked in the positive (upward) direction and outflows are stacked in the negative (downward) direction. Average annual water budgets (including inflows, outflows, and change in groundwater storage) for each MA are presented in Section 5.6.3 for the Pre-CVP Historical, Historical Recovery, Current and Future analysis periods. This section describes groundwater inflows and outflows, while section 5.7 discusses groundwater balance variations by water year type and section 5.8 discusses cumulative change in groundwater storage.

5.6.1. Inflows to Groundwater

Inflows to the groundwater flow system can be conceptualized as dispersed recharge through the land surface (such as rainfall recharge and irrigation return flow), linear sources of recharge (such as percolation from creeks and subsurface inflow along the Basin boundary) and point sources of recharge (such as wastewater percolation facilities). Most groundwater inflows to the basin are controlled by hydrologic conditions. Natural stream percolation and deep percolation from rainfall are related to the volume and distribution of rainfall. The availability of imported water similarly reflects wet and dry conditions in the source area, which for CVP water is the Sierra Nevada. Because they are related to rainfall, almost all Basin inflows are higher in wet years and lower in dry years. The water balance analysis includes several categories of inflow to the Basin, each of which is described below.

5.6.1.1. Dispersed Recharge from Rainfall and Irrigation

Dispersed recharge from rainfall and applied irrigation water is estimated by the rainfall-runoff-recharge model. The model simulates soil moisture storage in the root zone, with inflows from rainfall infiltration and irrigation, and outflows to evapotranspiration and deep percolation. Simulation is on a daily basis. In recharge zones with irrigated crops, irrigation is assumed to be applied when soil moisture falls below a certain threshold. When soil moisture exceeds the root zone storage capacity, the excess becomes deep percolation. Rainfall and irrigation water comingle in the root zone and in deep percolation. For the purposes of displaying an itemized water balance, the amount of deep percolation derived from irrigation is estimated as a percentage of the simulated irrigation quantity, and the remainder of the dispersed recharge is attributed to rainfall. In urban recharge zones, pipe leaks are included in the amount shown as rainfall recharge. Deep percolation of applied irrigation water (irrigation return flow) is generally similar from year to year, whereas rainfall percolation varies significantly on an annual basis. The one-dimensional dispersed recharge rates are multiplied by the surface area of each recharge zone (2,768 zones in total) to obtain volumetric flow rates, and those are subtotaled by Management Area. The dispersed rainfall estimates are calculated using the rainfall-runoff-recharge model and were adjusted slightly to match the total model inflow as some recharge zones overlapped Basin or management area boundaries. This allowed a more detailed itemization of the water balance but introduced minor discrepancies in the totals. In the water balance bar charts, dispersed recharge from rainfall and irrigation are shown in light blue and light green, respectively.

5.6.1.2. Percolation from Streams

Inflows to the stream network in the surface water module of the groundwater model include a combination of gauged flows (for the San Benito River at the upstream end of the Southern MA only), simulated runoff from tributary watersheds and valley floor areas obtained from the rainfall-runoff-

recharge model, and historical amounts of CVP water percolated in local streams. The effects of Hernandez Reservoir operation on San Benito River flows are included in the gauged flows, and the effects of Pacheco Reservoir on Pacheco Creek inflows were estimated by applying simple rules for seasonal storage and release. The effects of storage in the small Paicines Reservoir on San Benito River flows in the Southern MA were not considered. The surface water module simulates percolation from streams reach by reach along each stream that crosses the basin. Percolation is affected by groundwater levels. When groundwater levels are high there is less storage space available to receive stream percolation and overall percolation goes down. This phenomenon is known as "rejected recharge" and has been observed in field data as well as model results. It means that streams can provide high rates of recharge during the recovery period following a drought but not overfill the groundwater basin.

5.6.1.3. Reclaimed Water Percolation

Percolation of reclaimed water in wastewater disposal ponds occurs in two Management Areas (San Juan and Hollister) at facilities operated by the City of Hollister, SSCWD, and Tres Pinos County Water District (see **Figure 3-11** or **5-3** for locations). Discharges from the San Juan Bautista wastewater treatment plant flow are not included. These discharges occur to a small channel along the southwestern edge of San Juan Valley. That channel has little interaction with groundwater because it is southwest of the San Andreas Fault over much of its length. The remaining reach to San Juan Creek and the Pajaro River is underlain by clay soils that also do not support significant seepage fluxes to or from the channel. Wastewater releases to the City, SSCWD, and Tres Pinos ponds are measured directly. Percolation is assumed to be the plant inflow less net evaporation and amounts of wastewater recycled for irrigation use. Additional percolation may occur around rural residential septic systems. For the numerical model, it is assumed to be negligible as the volumes would be small and spread out all over the basin.

In the groundwater model, reclaimed water percolation and percolation of CVP water as incidental leakage from San Justo Reservoir are both simulated as shallow injection wells. Percolation of CVP water in off-channel recharge ponds has occurred in Hollister and San Juan MAs. The amounts have been relatively small and are not included in the groundwater model or water balance tables.

5.6.1.4. Subsurface Groundwater Inflow

Three types of subsurface inflow are listed separately in the water balance tables. Subsurface inflow from external basins occurs only in the Bolsa MA, where flow enters from the adjacent Llagas Subbasin. This is simulated as a head-dependent flow that varies depending on simulated groundwater levels near the boundary (lower water levels increase the simulated inflow rate). Along the rest of the Basin perimeter, small amounts of subsurface inflow results from recharge percolating through fractured bedrock in tributary watershed areas. This process is simulated by the rainfall-runoff-recharge model. Bedrock inflow is simulated as shallow injection wells along the perimeter of the Basin. Finally, subsurface flow occurs across the management area boundaries within the Basin. These flows are extracted from the groundwater model using the ZoneBudget post-processing utility program. In the water balance bar charts, Llagas inflow, bedrock inflow, and inflow from other Management Areas are shown in yellow, gray, and dark green, respectively.

5.6.2. Outflows from Groundwater

Major outflows from the Basin are pumping (agricultural, municipal, industrial, and domestic), groundwater seepage into streams, subsurface outflow, and evapotranspiration by riparian vegetation.

5.6.2.1. Pumping by Wells

Agricultural. Agricultural pumping is much larger than the other types and is listed separately in the water balance tables and shown in green on the water balance bar charts (**Figures 5-8** through **5-11**). Agricultural pumping is dependent not only on cropping patterns and irrigation practices, but also on the volume of CVP imports and the amount and timing of rainfall. Spring rains decrease total irrigation demand, and growers adjust pumping to compensate for wet weather and the availability of CVP imports. Agricultural groundwater pumping in the model and water balance tables is simulated by the rainfall-runoff-recharge model. When simulated soil moisture falls below a specified threshold in a recharge zone with irrigated crops, irrigation is assumed to be applied and to refill soil moisture to capacity. Irrigation not derived from CVP water or recycled water is assumed to be from groundwater. In the groundwater model, the agricultural pumping associated with each zone is located at the center of the zone.

Agricultural pumping in Zone 6 is also monitored by SBCWD by recording the operating time of pump motors and multiplying that by a measured discharge rate. Previous studies have found that the pumping estimates obtained by this method are significantly smaller than the estimates obtained by simulating crop water demand and soil moisture. The simulation approach improved model calibration during the 2014 model update, and that approach is retained in the current model.

Reliable measurements of agricultural pumping are a recognized data gap. Given the large range or uncertainty and the model sensitivity to the volume and location of agricultural pumping, evaluation is needed of alternative methodologies for accurately evaluating agricultural pumping.

Municipal, Industrial and Domestic. Municipal pumping by City of Hollister and SSCWD is in the Hollister MA, with additional pumping by San Juan Bautista in San Juan MA. Pumping by major municipal providers is measured, as is pumping by smaller community water systems and self-supplied commercial and industrial facilities within Zone 6. Actual pumping and well locations are used in the numerical model. Additional pumping for potable use at rural residences and agricultural buildings was estimated by inventorying the number and locations of those buildings on aerial photos. This domestic pumping is assigned to 200 hypothetical wells near building locations. This pumping is shown in the charts as pink in **Figures 5-8** through **5-11**.

5.6.2.2. Subsurface Outflow

Subsurface outflows were calculated using the groundwater model by the same methods used to simulate subsurface inflows. In the water balance tables and charts, shown in **Figures 5-8** through **5-11,** subsurface outflow to external basins (dark blue) is shown separately from outflow to other Management Areas (orange).

5.6.2.3. Groundwater Discharge to Streams

Discharges from the groundwater basin to surface water bodies are simulated by the groundwater model based on stream bed wetted area and permeability and on the amount by which the simulated groundwater elevation in a model stream cell is higher than the simulated surface water elevation. This occurs in all Management Areas, but notably where Pacheco Creek and Tequisquita Slough approach the Calaveras Fault, where the Pajaro River approaches the downstream end of the Bolsa MA, and along the San Benito River at the downstream end of the San Juan MA. The relatively large amounts of simulated groundwater discharge to streams in the Southern MA is balanced by high amounts of percolation from streams. The San Benito River and Tres Pinos Creek transition from gaining to losing at various locations

in the Southern MA. This outflow is shown in the water balance charts in a red color in **Figures 5-8** through **5-11**.

5.6.2.4. Riparian Evapotranspiration

The presence of dense, vigorous trees and shrubs along a stream channel is often a sign that the roots of the vegetation extend to the water table and have access to groundwater throughout the dry season. Plants that draw water directly from groundwater are called phreatophytes. Stream reaches with this type of vegetation were mapped from Google Earth aerial photos, and the width of the vegetation corridor was used to obtain the total area of phreatophyte evapotranspiration (ET). The rate of groundwater withdrawal was estimated as the difference in simulated ET when the vegetation was assumed to be non-irrigated (subsisting only on rainfall) versus irrigated (accessing all water needed to meet potential ET). In the groundwater model, riparian ET is a function of water table depth, decreasing from unrestricted water use when the water table is at the ground surface to zero when it is 15 feet or more below the ground surface. This reflects a reasonable range of root depth distribution for a mix of riparian shrub and tree species. Riparian ET is shown with a blue color on the water balance bar charts in **Figures 5-8** through **5-11**.

5.6.3. Summary by Management Area

5.6.3.1. Southern MA

Figure 5-8 and **Table 5-6** summarize groundwater balances for the Southern MA. The Southern MA includes long reaches of the San Benito River and Tres Pinos Creek as they first enter the groundwater basin. The dominant land use is natural grassland and shrubs. Given that, the major inflows to and outflows from groundwater are dominated by percolation from streams and groundwater discharge into streams. As shown on **Figure 5-8** and **Table 5-6**, percolation from surface water accounts for more than 70 percent of inflow and discharge to streams represents more than 50 percent of outflow. Percolation from stream channels into the Southern MA is significantly higher in wet years than dry years. As illustrated in **Figure 5-6**, wet-year inflow from streams can average four times more than in critically dry years. Similarly, outflow to streams varies substantially. Agricultural pumping in the Management Area remains steady at approximately 6,700 AFY. The small amount of inflow from the Hollister MA is an artifact of local deviations in the boundary alignment relative to the prevailing flow gradient, which is from the Southern MA to the Hollister MA. The relatively large increase in groundwater storage during the current period reflects groundwater recovery following the 2013-2015 drought and concurrent decrease in groundwater discharge to streams. Under future baseline conditions average annual rainfall is less than during the prior periods (reflecting the difference between historical measured or estimated rainfall during 1922-1974 versus 1975-2017). Stream flow and rainfall recharge are both nonlinear functions of rainfall, such that a percentage decrease in rainfall will produce a larger percentage decrease in runoff and recharge. However, the reduction in recharge from streams and rainfall is balanced by changes in other inflows and outflows so that the average annual storage change for the future baseline scenario is close to zero.

Table 5-6. Average Annual Groundwater Balance, Southern Management Area (AFY)

Water Balance Items	Historical		Current	Future[2]
	Pre-CVP 1975-1988	Recovery 1989-2014	2015-2017	
Groundwater Inflow				
Subsurface inflow from external basins	0	0	0	0
Percolation from streams	28,241	24,454	25,556	24,526
Bedrock inflow	1,601	1,693	684	1,119
Dispersed recharge from rainfall[1]	5,810	5,954	8,595	4,439
Irrigation deep percolation	597	576	659	624
Reclaimed water percolation	0	0	0	0
Inflow from Hollister MA	940	954	941	822
Total inflow	**37,189**	**33,632**	**36,434**	**31,530**
Groundwater Outflow				
Subsurface outflow to external basins	0	0	0	0
Wells - M&I and domestic	(53)	(126)	(143)	(142)
Wells – agricultural	(6,626)	(6,396)	(7,157)	(6,911)
Groundwater discharge to streams	(20,482)	(18,851)	(12,911)	(19,297)
Riparian evapotranspiration	(1,675)	(1,572)	(1,563)	(1,587)
Outflow to Hollister MA	(3,328)	(3,357)	(3,215)	(2,991)
Total outflow	**(32,163)**	**(30,304)**	**(24,988)**	**(30,928)**
Net Change in Storage	**5,026**	**3,328**	**11,446**	**603**

1. Dispersed recharge volumes adjusted from pre-processor to match model inflows.
2. Average for 1925-1953 and 1982-2002 combined (50 years total).

5.6.3.2. Hollister MA

Groundwater balances for the Hollister MA are summarized in **Figure 5-9** and **Table 5-7**. As shown on **Figure 5-9**, inflows to the Hollister MA are largely from deep percolation of precipitation and percolation of surface water (i.e., San Benito River and others). Both sources are much larger (more than double) in wet years than in normal or dry years. Percolation from streams is relatively high and groundwater discharge to streams is relatively low when groundwater levels are low, such as in the Historical and Current periods (due to prior overdraft and to drought, respectively). As shown in **Table 5-7**, groundwater inflow from bedrock in tributary watersheds was considerably lower during the current period than the other periods. This was because bedrock inflow is relatively slow and reflects average hydrologic conditions over the preceding several years. During the three-year current period it was still depressed from the 2013-2015 drought.

The outflow from Hollister is dominated by agricultural pumping (more than 65 percent of total outflow), followed by outflow to other MAs (more than 15 percent). Agricultural pumping was relatively high in the Current period due to reduced allocations of CVP water during the 2013-2015 drought (see **Figure 5-9**). Future agricultural groundwater pumping is expected to be about the same as it was during the Recovery period. M&I pumping increased from the Pre-CVP Historical to Recovery period reflecting a growing population but decreased in the current period reflecting the new treatment capacity to replace

groundwater with CVP water for M&I uses. Future M&I pumping is higher than current pumping because of reduced long-term average CVP allocations, but wastewater percolation remains about the same. Outflow to other MAs was relatively low during the Current period, probably because the drought-related reduction in CVP use caused a greater increase in groundwater pumping (and hence decrease in groundwater levels) in the Hollister MA relative to the Bolsa MA. This would decrease the water level gradient and reduce the flow. The average annual decline in storage in the Future period is small relative to total inflows and outflows and is probably within the range of uncertainty of the overall water balance. For example, simulated storage change for the overall 1922-2007 period was positive (see Section 5.8).

Table 5-7. Average Annual Groundwater Balances, Hollister Management Area (AFY)

Water Balance Items	Historical		Current	Future[2]
	Pre-CVP 1975-1988	Recovery 1989-2014	2015-2017	
Groundwater Inflow				
Subsurface inflow from external basins	0	0	0	0
Percolation from streams	30,021	24,831	28,192	21,671
Bedrock inflow	4,075	4,115	427	3,143
Dispersed recharge from rainfall[1]	19,455	18,336	23,709	17,414
Irrigation deep percolation	4,747	4,511	5,132	4,761
Reclaimed water percolation	1,250	1,841	2,603	2,486
Inflow from Southern MA	7,033	6,455	6,371	6,043
Total inflow	**66,580**	**60,089**	**66,434**	**55,517**
Groundwater Outflow				
Subsurface outflow to external basins	0	0	0	0
Wells - M&I and domestic	(3,885)	(6,905)	(4,424)	(5,627)
Wells - agricultural	(39,049)	(38,278)	(45,458)	(38,411)
Groundwater discharge to streams	(844)	(2,541)	(635)	(2,203)
Riparian evapotranspiration	(173)	(174)	(118)	(158)
Outflow to Bolsa and San Juan MAs	(10,294)	(9,439)	(8,717)	(10,176)
Total outflow	**(54,245)**	**(57,337)**	**(59,351)**	**(56,575)**
Net Change in Storage	**12,336**	**2,752**	**7,083**	**(1,058)**

1. Dispersed recharge volumes adjusted from pre-processor to match model inflows.
2. Average for 1925-1953 and 1982-2002 combined (50 years total).

5.6.3.3. San Juan MA

The groundwater balances for San Juan MA are shown on **Figure 5-10** and **Table 5-8**. Inflow to San Juan MA is mostly deep percolation of rainfall and irrigation water (31-39 percent) and percolation from the San Benito River and San Juan Creek (25-36 percent) followed by inflow from the Hollister MA (16-22 percent). As illustrated in **Figure 5-10**, wet-year percolation from surface water and rainfall can average almost 30,000 AFY compared to only 3,000 AFY in critically dry years.

Relative to inflow, groundwater outflow is relatively steady and consists mainly of agricultural pumping (80-86 percent). As in the Hollister MA, average pumping decreased from the Pre-CVP Historical to the

Recovery period due to CVP imports and increased in the Current period due to drought-related reductions in CVP supplies. Groundwater discharge to the San Benito River increased from the Historical to the Current periods as groundwater levels recovered. This discharge is important as a means of removing salts from the basin and limiting long-term increases in groundwater salinity. Average annual storage change was positive during the Historical and Current periods due to long-term recovery of groundwater levels. Future storage change is expected to average around zero, in the baseline simulation.

Table 5-8. Average Annual Groundwater Balances, San Juan Management Area (AFY)

	Historical			
Water Balance Items	**Pre-CVP 1975-1988**	**Recovery 1989-2014**	**Current 2015-2017**	**Future[2]**
Groundwater Inflow				
Subsurface inflow from external basins	0	0	0	0
Percolation from streams	9,456	6,321	6,056	5,573
Bedrock inflow	774	1,328	1,110	1,140
Dispersed recharge from rainfall[1]	8,239	7,703	9,585	7,039
Irrigation deep percolation	2,151	1,924	1,942	2,161
Reclaimed water percolation	609	1,441	1,843	1,734
Inflow from Hollister and Bolsa MAs	5,239	4,188	4,026	4,910
Total inflow	**26,469**	**22,904**	**24,563**	**22,557**
Groundwater Outflow				
Subsurface outflow to external basins	0	0	0	0
Wells - M&I and domestic	(581)	(917)	(476)	(652)
Wells - agricultural	(17,936)	(16,588)	(17,490)	(18,364)
Groundwater discharge to streams	(80)	(637)	(835)	(1,170)
Riparian evapotranspiration	(740)	(959)	(1,065)	(1,042)
Outflow to Bolsa MA	(1,451)	(1,546)	(1,578)	(1,686)
Total outflow	**(20,790)**	**(20,645)**	**(21,444)**	**(22,914)**
Net Change in Storage	**5,679**	**2,259**	**3,118**	**(357)**

1. Dispersed recharge volumes adjusted from pre-processor to match model inflows.
2. Average for 1925-1953 and 1982-2002 combined (50 years total).

5.6.3.4. Bolsa

The annual groundwater inflows and outflows for the Bolsa MA are shown on **Figure 5-11** and **Table 5-9**. The largest source of inflow is rainfall recharge, but it varies greatly by year type: accounting for over half of total inflow during a wet year like 2017 and only 7 percent during a dry year like 2013. Rainfall recharge is relatively low in the Future period because average annual rainfall is smaller and the nonlinear relationship between rainfall and recharge causes an even larger decrease in recharge on a percentage basis. Subsurface inflow from the Hollister MA is relatively stable at around 5,000 AFY.

As described in the Management Area section, Bolsa does not receive CVP imported water and thus relies on groundwater pumping, which is 64-81 percent of total outflow. The area of irrigated cropland

increased in the past decade, resulting in the increase in pumping from the Recovery to the Future period. The even higher amount during the Current period is the result of drought conditions. The recent increase in irrigated area combined with minor changes in parameters used to estimate irrigation demand resulted in agricultural pumping estimates in the current model that are larger than estimates previously presented in annual groundwater reports. The next largest outflow is discharge to streams (including water from tile drains and flowing wells listed in the table as "shallow discharge to streams"), which accounts for 11-26 percent of total outflow. This outflow increases noticeably in wet years.

Table 5-9. Average Annual Groundwater Balances, Bolsa Management Area (AFY)

	Historical			
Water Balance Items	**Pre-CVP 1975-1988**	**Recovery 1989-2014**	**Current 2015-2017**	**Future[2]**
Groundwater Inflow				
Subsurface inflow from external basins	4,176	3,761	5,940	5,088
Percolation from streams	3,744	2,860	4,582	3,396
Bedrock inflow	0	0	71	0
Dispersed recharge from rainfall[1]	11,756	11,088	16,184	8,431
Irrigation deep percolation	1,427	1,395	2,257	2,863
Reclaimed water percolation	0	0	0	0
Inflow from Hollister and San Juan MAs	4,560	4,740	4,415	4,954
Total inflow	**25,662**	**23,844**	**33,448**	**24,733**
Groundwater Outflow				
Subsurface outflow to external basins	(34)	(42)	(17)	(21)
Wells - M&I and domestic	(9)	(22)	(24)	(24)
Wells - agricultural	(15,860)	(15,467)	(24,017)	(19,958)
Groundwater discharge to streams	(4,463)	(6,293)	(3,761)	(2,683)
Riparian evapotranspiration	(251)	(256)	(192)	(213)
Outflow to San Juan MA	(2,699)	(1,995)	(2,350)	(1,877)
Total outflow	**(23,315)**	**(24,076)**	**(30,362)**	**(24,775)**
Net Change in Storage	**2,347**	**(232)**	**3,087**	**(42)**

1. Dispersed recharge volumes adjusted from pre-processor to match model inflows.
2. Average for 1925-1953 and 1982-2002 combined (50 years total).

5.7. Variation in Water Budget by Water Year Type

In each MA, the contribution from each source of inflow varies in response to hydrological conditions. Accordingly, **Table 5-10** shows the average annual water balance during the Historical and Current analysis (1975-2017) based on water year type (wet, above average, normal, dry, and critically dry). In general, inflows respond to changes in hydrological conditions, but outflows remain dominated by pumping that is fairly consistent across all water year types. In all MAs, inflow varies greatly from high volumes of inflow in wet years to minimal volumes of inflow during critically dry years. The result is that the basin gains groundwater storage in wet years and loses storage in dry years.

Table 5-10. Inflows and Outflows by Water Year Type (AFY)

	Water Year Type				
	Wet Year	Above Normal	Normal	Dry	Critically Dry
Southern MA					
Inflow	63,081	37,081	27,131	21,120	13,260
Outflow	(32,601)	(32,234)	(27,040)	(30,576)	(27,319)
Change in Storage	30,480	4,847	92	(9,456)	(14,059)
Hollister MA					
Inflow	96,071	68,817	51,562	45,374	33,891
Outflow	(51,522)	(54,785)	(58,933)	(58,394)	(62,151)
Change in Storage	44,549	14,032	(7,371)	(13,020)	(28,260)
San Juan MA					
Inflow	40,008	26,688	17,776	15,978	12,018
Outflow	(18,178)	(20,105)	(21,943)	(21,774)	(23,388)
Change in Storage	21,831	6,584	(4,167)	(5,796)	(11,369)
Bolsa MA					
Inflow	35,787	26,246	21,417	19,395	17,488
Outflow	(28,731)	(25,193)	(21,595)	(21,931)	(21,177)
Change in Storage	7,056	1,054	(178)	(2,536)	(3,689)

5.8. Change in Groundwater Storage

The water balance tables show two estimates of storage: the difference between total inflows and total outflows, and the amount simulated by the groundwater model.

Figure 5-12 shows the cumulative change in storage from the model for the four Management Areas for the Historical and Current periods, 1975-2017. The amount of groundwater in storage fluctuated over the simulation period. Groundwater storage was at its lowest near the beginning of the simulation because of overdraft during the preceding decades and an intense drought during 1976-1977. For Hollister and San Juan MAs, groundwater storage increased significantly when imported water deliveries begin in 1988. With decreased groundwater pumping, managed aquifer recharge, and several wet years in the 1990s, groundwater storage increased rapidly in these two MAs and has remained relatively steady since 1998. As discussed in Section 4.1.3, the recovery of groundwater levels and storage in those Management Areas provided a buffer for the recent drought of 2013-2015, allowing local groundwater users to pump groundwater without severe declines.

Evaluation of storage change in the Southern MA is less certain because of the scarcity of hydrogeologic and monitoring data to correctly estimate the initial storage in 1975. The rapid increase in storage during the 1990s resulted primarily from wet years during that decade (no CVP water is delivered to this MA), but the overall long-term increasing trend is likely the result of having underestimated the 1975 water levels. The model gradually added water to storage until the simulated water-level surface in upland areas achieved a balance between recharge rates and estimated aquifer permeability and storativity.

Groundwater storage in the Bolsa MA remained relatively steady during 1975-2017. In wet years, high rainfall recharge tended to be balanced by greater groundwater discharge to streams. There were also some compensating effects among different parts of the Management Area. East of the Calaveras Fault, some hydrographs showed water levels rising several tens of feet until intersecting the land surface elevation in the mid-1990s, then leveling out. In contrast, hydrographs west of the fault declined through about 1988, rose to the mid-1990s, then generally leveled out. A few hydrographs in that area have exhibited slight long-term declining trends, and the model calibration slightly overestimated some of those declines.

Figure 5-13 shows cumulative storage changes in each of the Management Areas under simulated future conditions. These are the results of a continuous 86-year simulation corresponding to hydrologic conditions during 1922-2007. As indicated on the figure, fifty years were extracted from the simulation results to represent future baseline conditions for water balance calculations. Imported CVP water was assumed to be available throughout the Future period in amounts simulated by DWR's CalSim2 model. Average availability over the Future period was less than during the Recovery period, but the results indicated sufficiency to prevent overdraft.

Conjunctive operation of local groundwater with CVP imports nevertheless resulted in substantial groundwater storage declines during droughts followed by recovery in wet years. This can be seen during the simulation intervals corresponding to historical hydrology during 1923-1934 and 1987-1992. Those droughts produced large cumulative deficits in local rainfall and CVP deliveries and large cumulative decreases in groundwater storage. CVP allocations to agricultural users in the Basin dropped to about 8,900 AFY and 4,600 AFY during the two droughts, respectively, compared to the long-term

average of 17,600 AFY. There was a large simulated increase in groundwater pumping to compensate for the decreased CVP deliveries. This caused cumulative storage declines of 165,000 AF in the Hollister MA and 65,000 AF in the San Juan MA during the 1923-1934 drought (121,000 AF and 52,000 AF during 1987-1992). However, simulated storage in both of those areas recovered to pre-drought levels within 6-10 years.

The Southern MA and to a lesser extent the Bolsa MA also experienced cumulative storage declines during the drought periods, but those were due solely to decreased rainfall and stream recharge. In those Management Areas, simulated storage also recovered during the 6-10 years following the droughts.

5.9. Estimate of Sustainable Yield

The sustainable yield is defined as the volume of pumping that the basin can sustain without causing undesirable effects. It is not a fixed or inherent natural characteristic of a groundwater basin. Rather, it is influenced by land use activities, importation of water, wastewater and stormwater management methods, and the locations of wells with respect to interconnected streams. The estimate of sustainable yield presented in this section reflects the current status of those variables and evaluates whether there would be a long-term increase or decrease in basin storage if those conditions continued over a 50-year Future period with local hydrology and CVP imports (per CalSim2) corresponding to 1925-1953 and 1982-2002.

A long analysis period is needed to evaluate yield because of changes in the relative amounts of recharge and pumping from normal or wet conditions to droughts and back again. In basins like this one where groundwater and surface water supplies are used conjunctively, groundwater storage is expected to decline during droughts and recover afterwards. In a dry year when imported supplies are generally limited, the volume of groundwater pumped is generally higher. This increased pumping can be sustained for limited periods of time as long as the basin is subsequently replenished. In wet years when rainfall recharge is relatively high, imported supplies are more available and groundwater pumping is generally reduced, recharge exceeds pumping and storage recovers. Therefore, the evaluation of long-term storage trends needs to span one or more complete wet-dry-wet climate cycles. The two-part period of years selected for the future baseline simulation includes complete drought and recovery cycles for the 1923-1935 drought and 1987-1992 drought, which were the two largest droughts in terms of effect on simulated water levels.

The estimate of sustainable yield was based on the future baseline simulation. It is a forward-looking estimate that incorporates current land use, CVP operating rules, and other management activities. To evaluate a sustainable yield, the average pumping that occurred during the 1925-1953 and 1982-2002 periods of the future baseline simulation was calculated. Average annual pumping by Management Area and type of use in the future baseline simulation is as shown in **Table 5-11** and totals 90,089 AFY.

If the simulation showed a net decline in groundwater storage over the simulation period, the sustainable yield would be less than the amount of pumping in the simulation, and vice versa. In the future baseline simulation, net change in groundwater storage was essentially zero (see **Tables 5-6** through **5-9**). Specifically, average annual storage change was +/- 1% for Hollister, San Juan and Bolsa MAs and 3% for Southern MA, which is within the range of uncertainty in the modeled water balance.

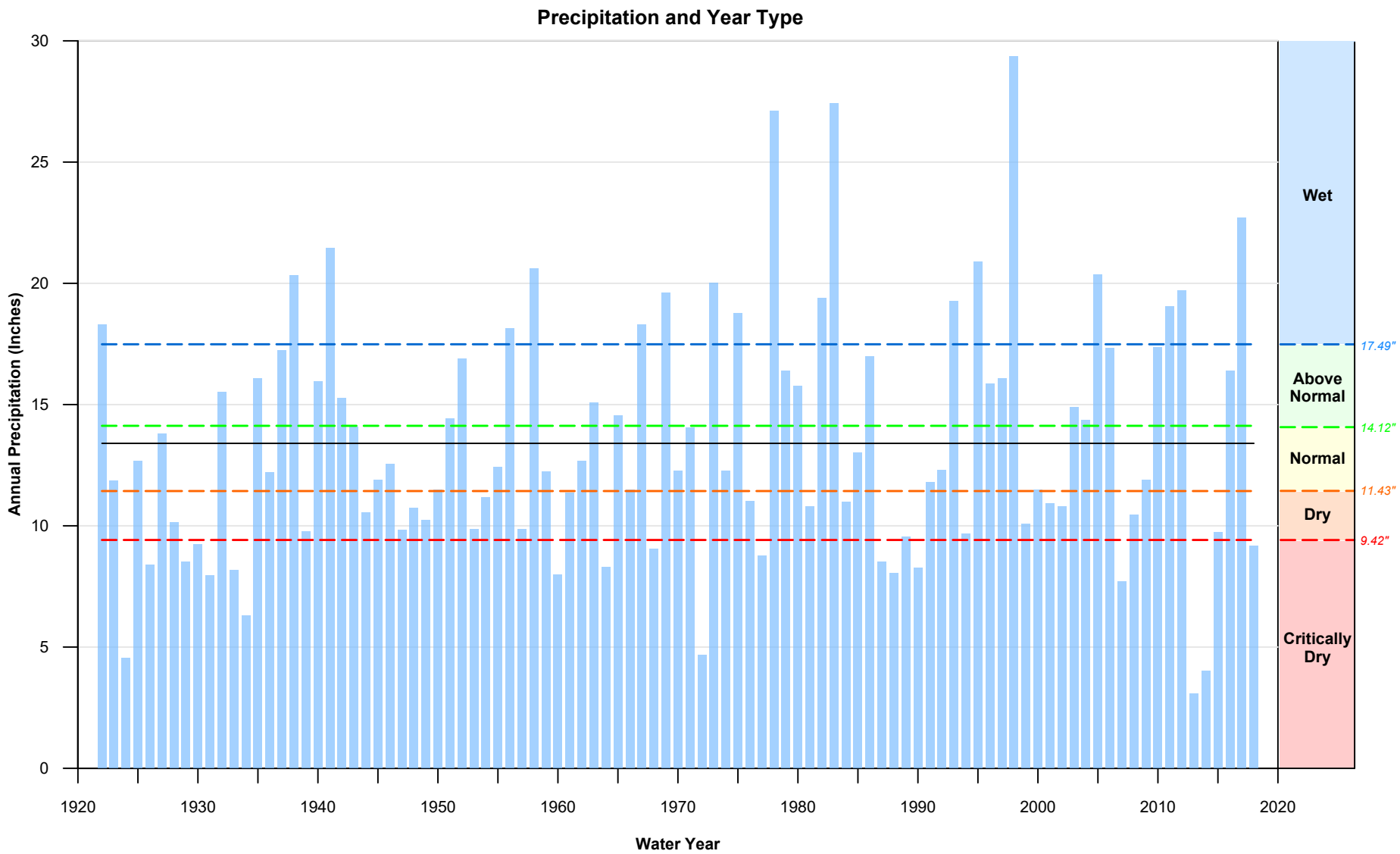
Therefore, average annual groundwater pumping in the future baseline simulation is the best available estimate of sustainable yield.

This long-term average sustainable yield reflects a continuation of existing conditions. Significant changes in management (e.g., the recent completion of additional treatment capacity for imported water) or significant climate changes (e.g., reduction in precipitation) would affect the yield of the basin. Accordingly, sustainable yield is not a fixed number.

Moreover, the definition of sustainable yield refers to undesirable results, which are quantified through the sustainability criteria (i.e., minimum thresholds and measurable objectives) and have important ramifications for overall sustainable yield. Accordingly, this sustainable yield value is a broad indicator. It indicates no overdraft based on the water budget, but it must be interpreted through evaluation of undesirable results.

Table 5.11 Average Annual Pumping (AFY) by Management Area, Future Baseline

Management Area	Future Baseline		
	Agricultural Pumping	M&I Pumping	TOTAL
Southern	6,911	142	7,053
Hollister	38,411	5,627	44,038
San Juan	18,364	652	19,017
Bolsa	19,958	24	19,982
Total	**83,643**	**6,446**	**90,089**



Average Annual Precipitation (13.40")

Precipitation

November 2021

TODD GROUNDWATER

Figure 5-1
Annual Precipitation

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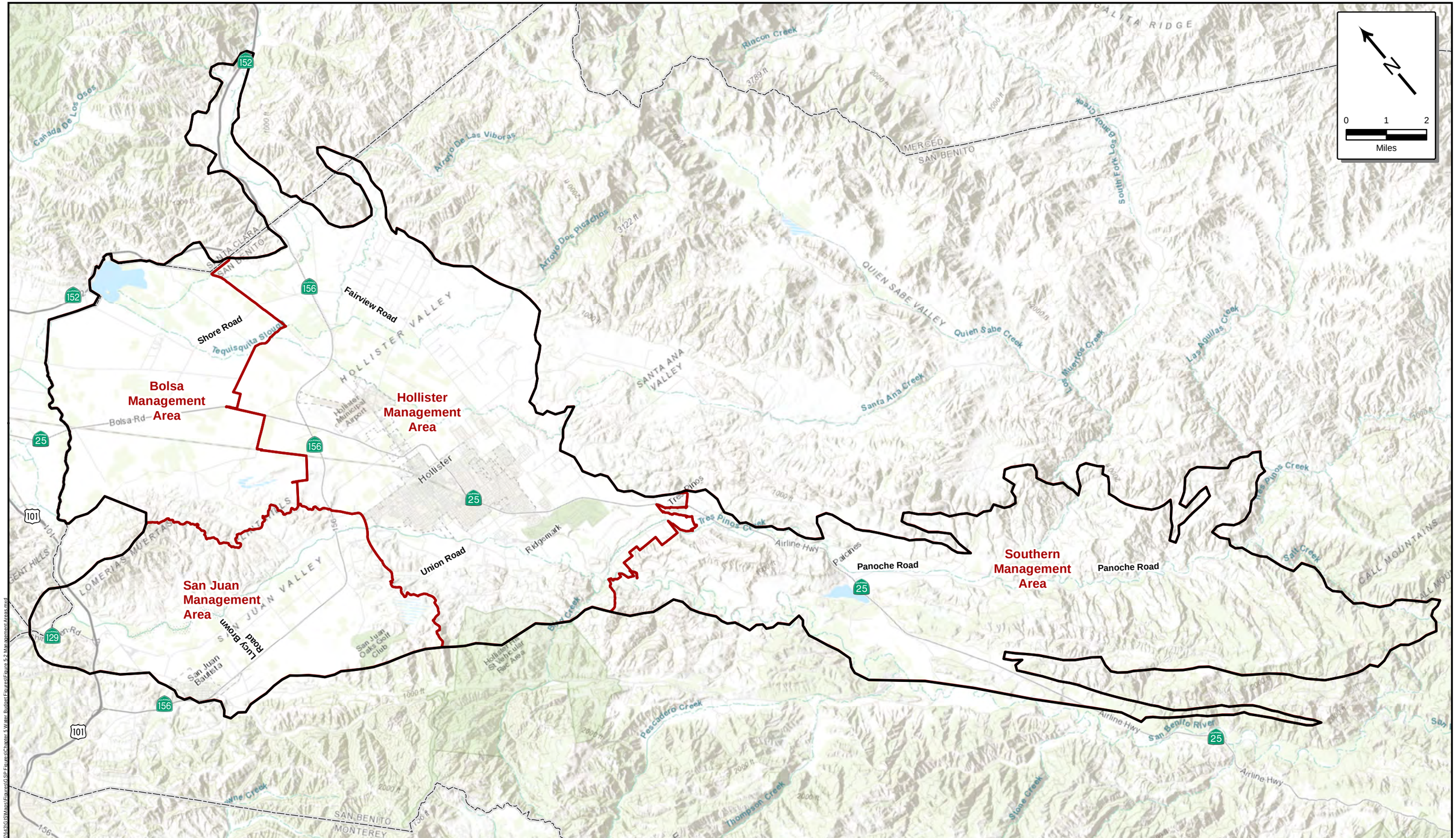


North San Benito Basin

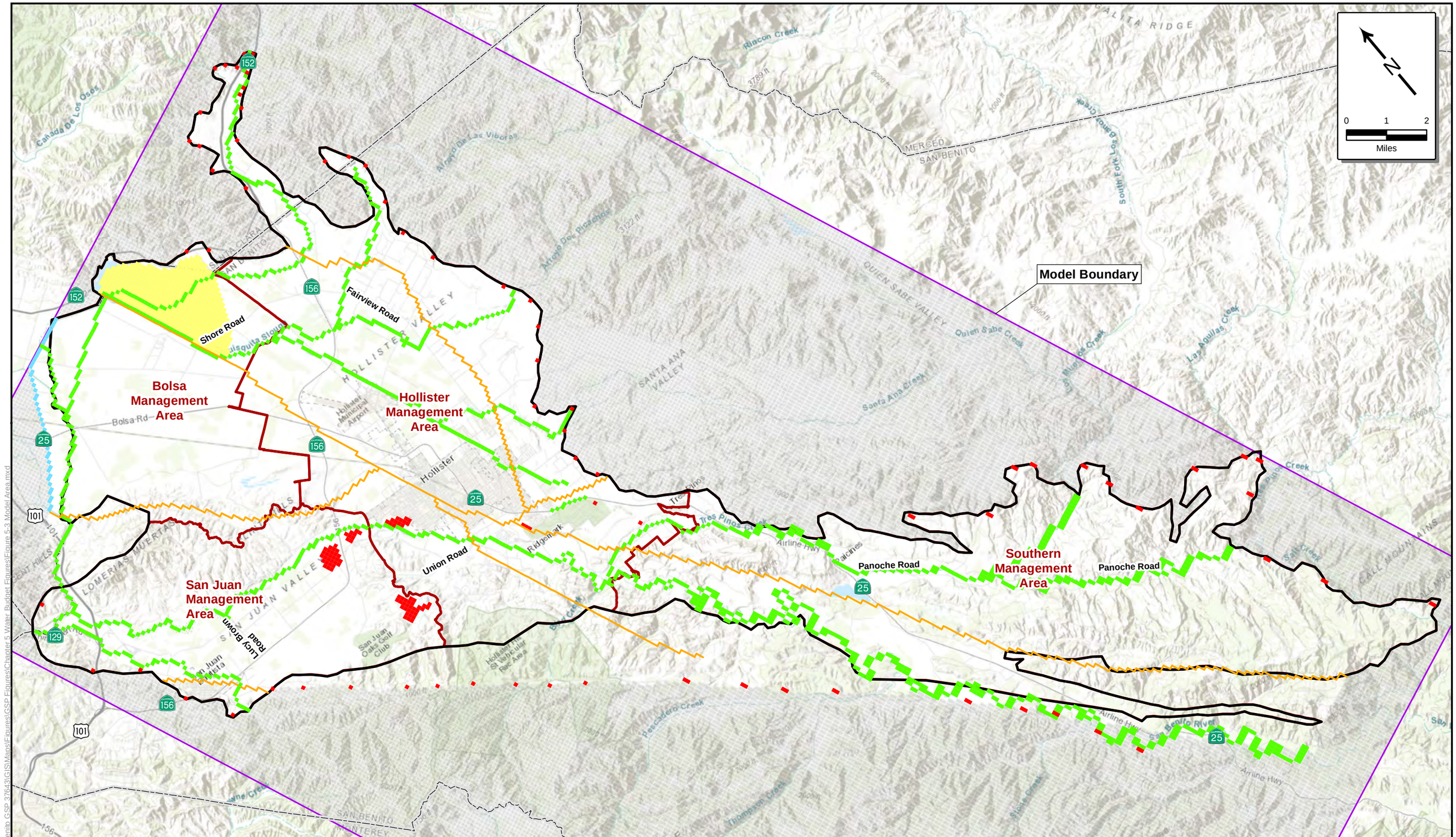
Management Areas

San Benito County

November 2021

TODD GROUNDWATER

Figure 5-2
Management Areas



North San Benito Basin
Management
San Benito County
Flowing Wells Area
Subsurface Inflow from Llagas
Wastewater Ponds, San Justo and Bedrock Inflow
Stream Cells
Inactive Cells
Faults in Model

November 2021

TODD GROUNDWATER

Figure 5-3
Model Area

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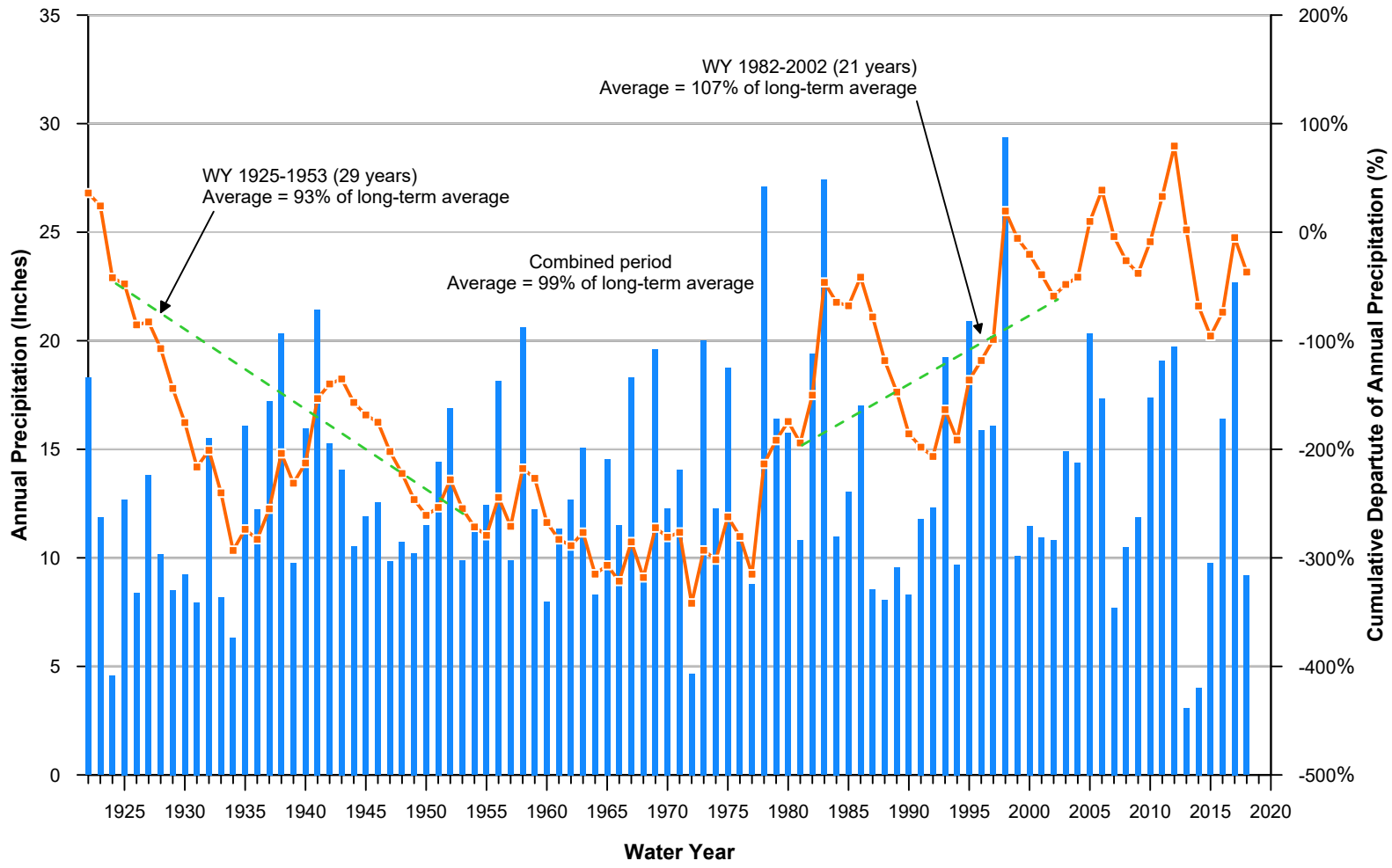

Precipitation

Departure

November 2021

TODD GROUNDWATER

Figure 5-4
Cumulative Departure of Precipitation

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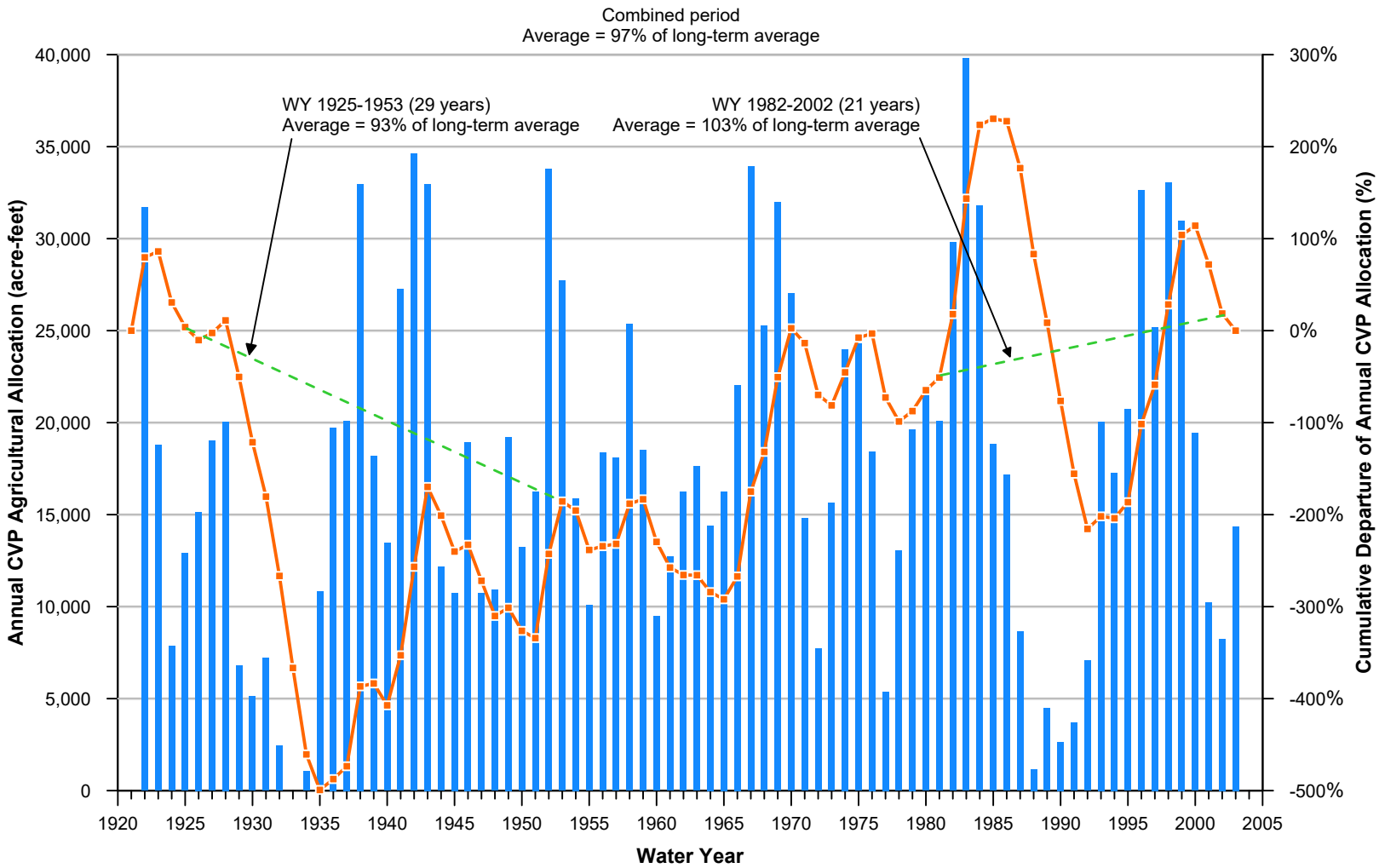

(Simulated CVP availability from CalSim2 model)

Annual CVP Agricultural Allocation

Departure

November 2021

TODD GROUNDWATER

Figure 5-5
Cumulative Departure of CVP Availability

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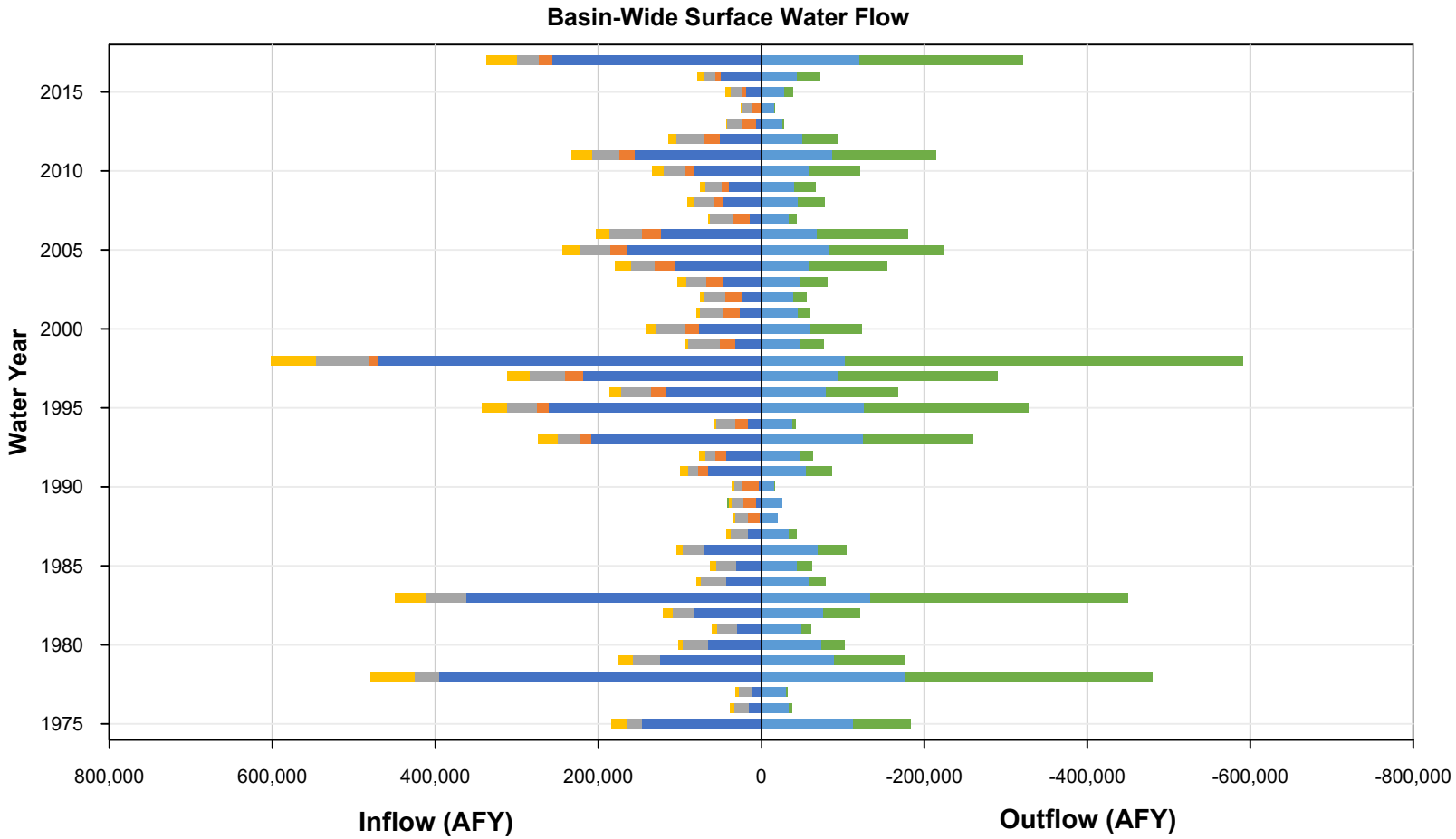


Inflows

- Valley floor runoff
- Seepage from groundwater
- CVP imports
- Local watershed inflows

Outflows

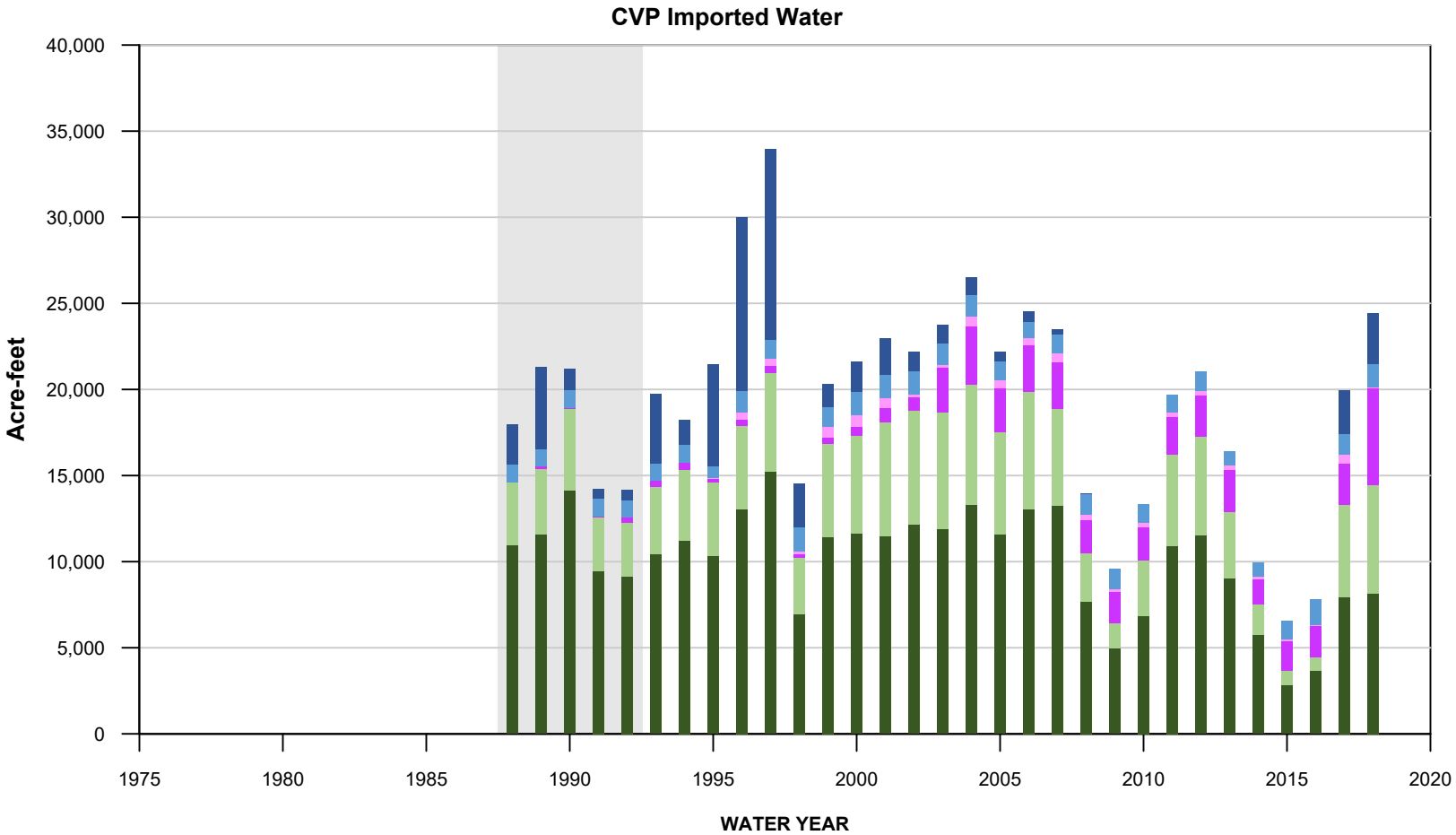
- Percolation to groundwater
- Outflow to Pajaro River

November 2021

TODD GROUNDWATER

Figure 5-6
Surface Water Inflow and Outflow of the Basin

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure5-6 Surface Water Inflow and Outflow of the Basin.gpj



Percolation at creeks
Seepage & evaporation
San Juan - M&I and domestic
Hollister - M&I and domestic
San Juan - agricultural
Hollister - agricultural

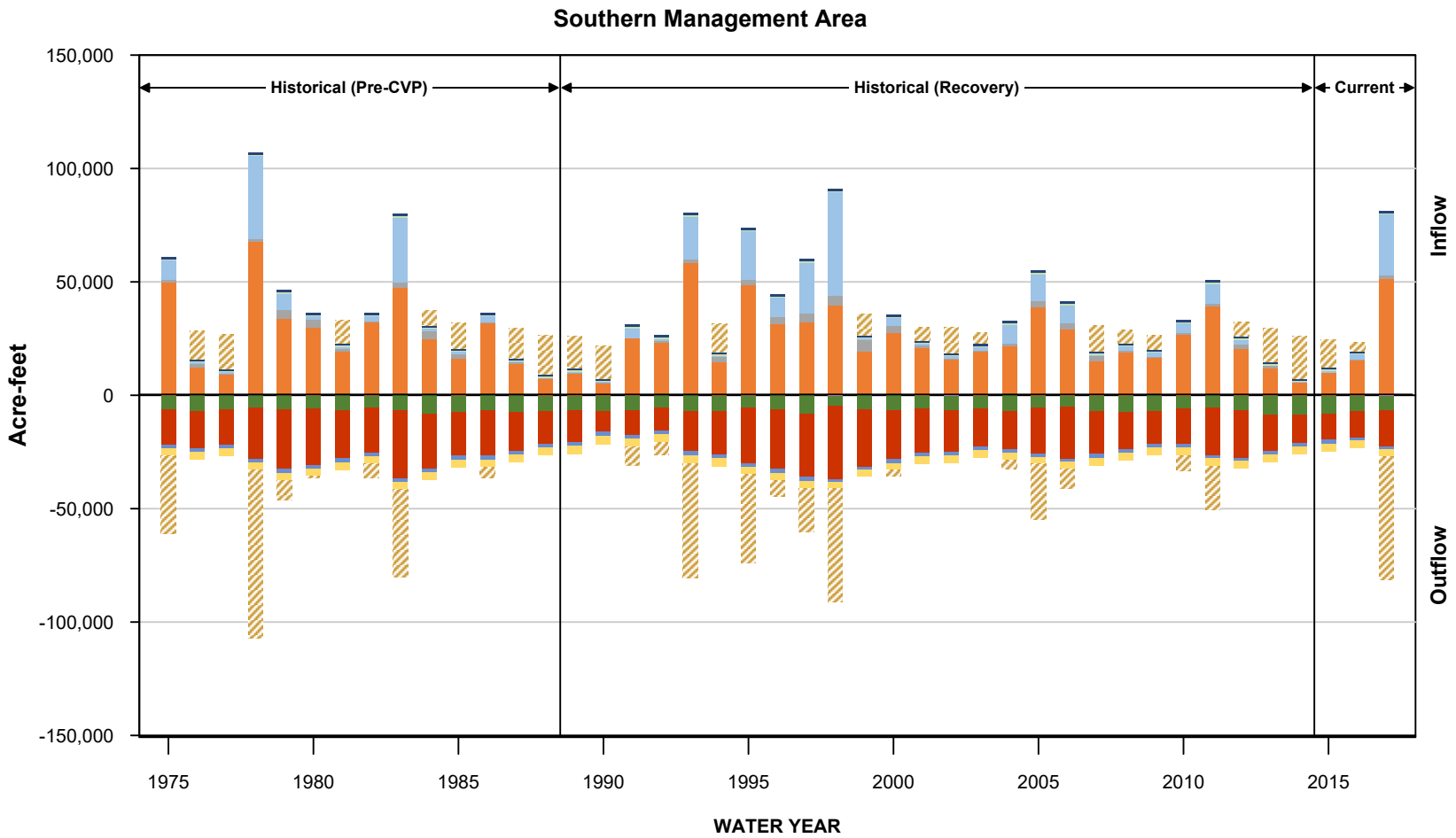
Note:
Only total volumes available from 1988-1992. Distribution between MAs based on average values

November 2021

TODD GROUNDWATER

Figure 5-7
CVP Imported Water to the Basin

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure5-7 CVP Imported Water.gpj



Inflows

- Inflow from Hollister MA
- Reclaimed water percolation
- Irrigation deep percolation
- Dispersed recharge from rainfall
- Bedrock inflow
- Percolation from streams
- Subsurface inflow from external basins

Outflows

- Shallow discharge to streams
- Subsurface outflow to external basin
- Wells - M&I and domestic
- Wells - agricultural
- Groundwater discharge to streams
- Riparian evapotranspiration
- Outflow to Hollister MA

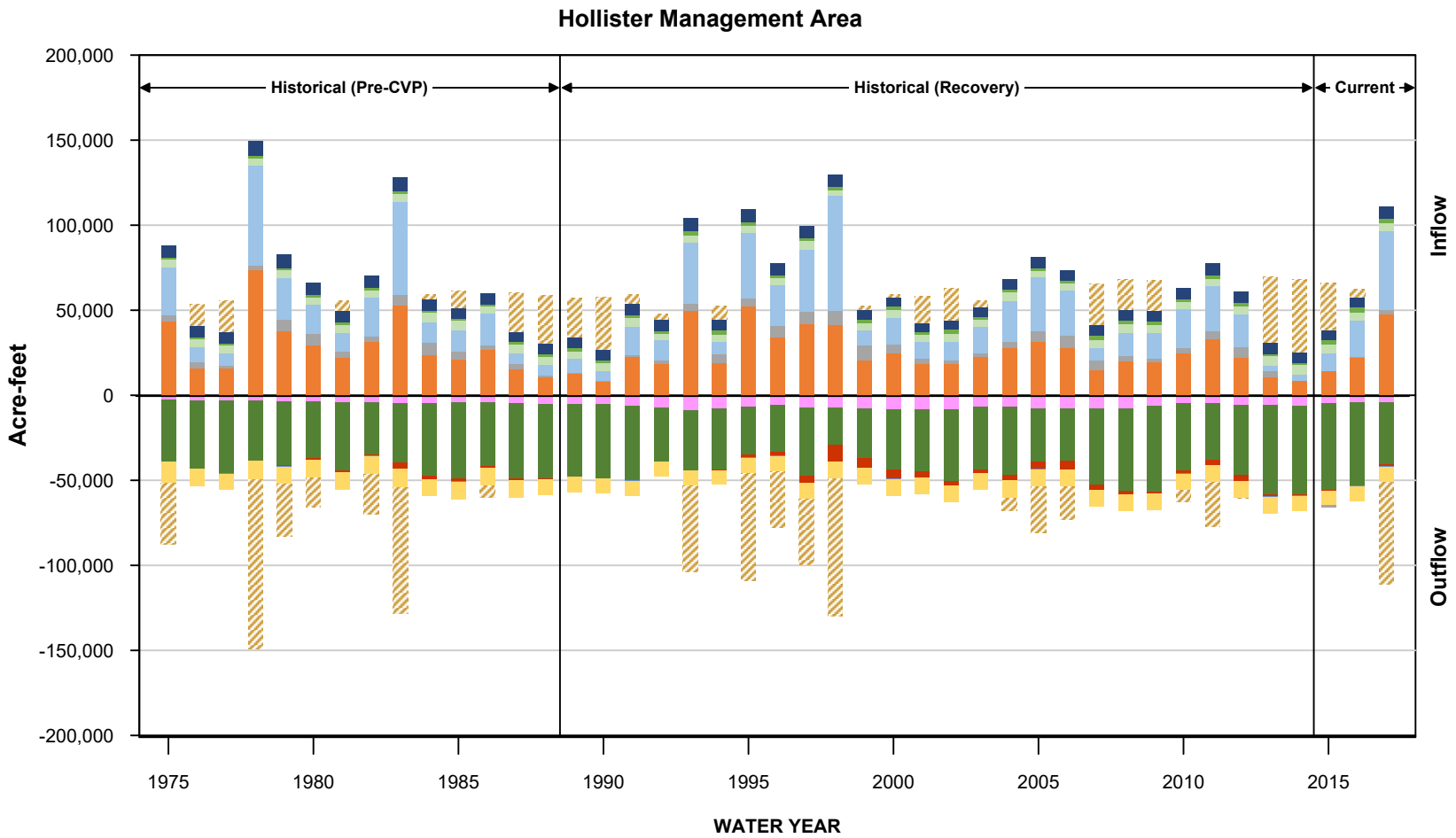
- Storage Change

November 2021

TODD GROUNDWATER

Figure 5-8
Historical and Current Groundwater Inflows and Outflows Southern MA

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure5-8 Water Balance Southern Management Area.gpj



Inflows

- Inflow from Southern MA
- Reclaimed water percolation
- Irrigation deep percolation
- Dispersed recharge from rainfall
- Bedrock inflow
- Percolation from streams
- Subsurface Inflow from external basins

Outflows

- Shallow discharge to streams (Shallow)
- Subsurface outflow to external basins
- Wells - M&I and domestic
- Wells - agricultural
- Groundwater discharge to streams
- Riparian evapotranspiration
- Outflow to Bolsa and San Juan MAs

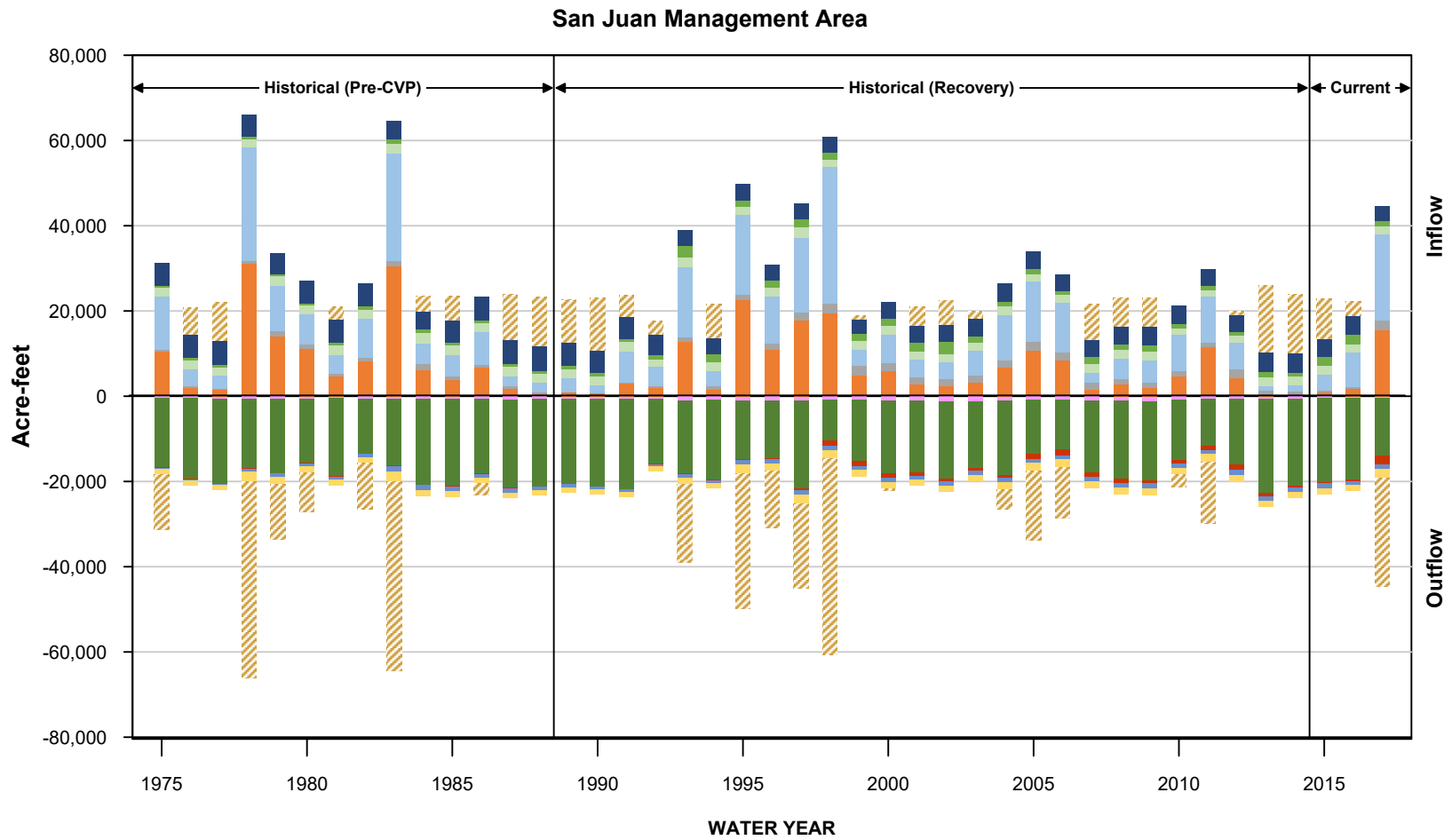
- Storage Change

November 2021

TODD GROUNDWATER

Figure 5-9
Historical and Current Groundwater Inflows and Outflows Hollister MA

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure5-9 Water Balance Hollister Management Area.gpj



Inflows

- Inflow from Hollister MA
- Reclaimed water percolation
- Irrigation deep percolation
- Dispersed recharge from rainfall
- Bedrock inflow
- Percolation from streams
- Subsurface inflow from external basins

Outflows

- Shallow discharge to streams
- Subsurface outflow to external basins
- Wells - M&I and domestic
- Wells - agricultural
- Groundwater discharge to streams
- Riparian evapotranspiration
- Outflow to Bolsa MA

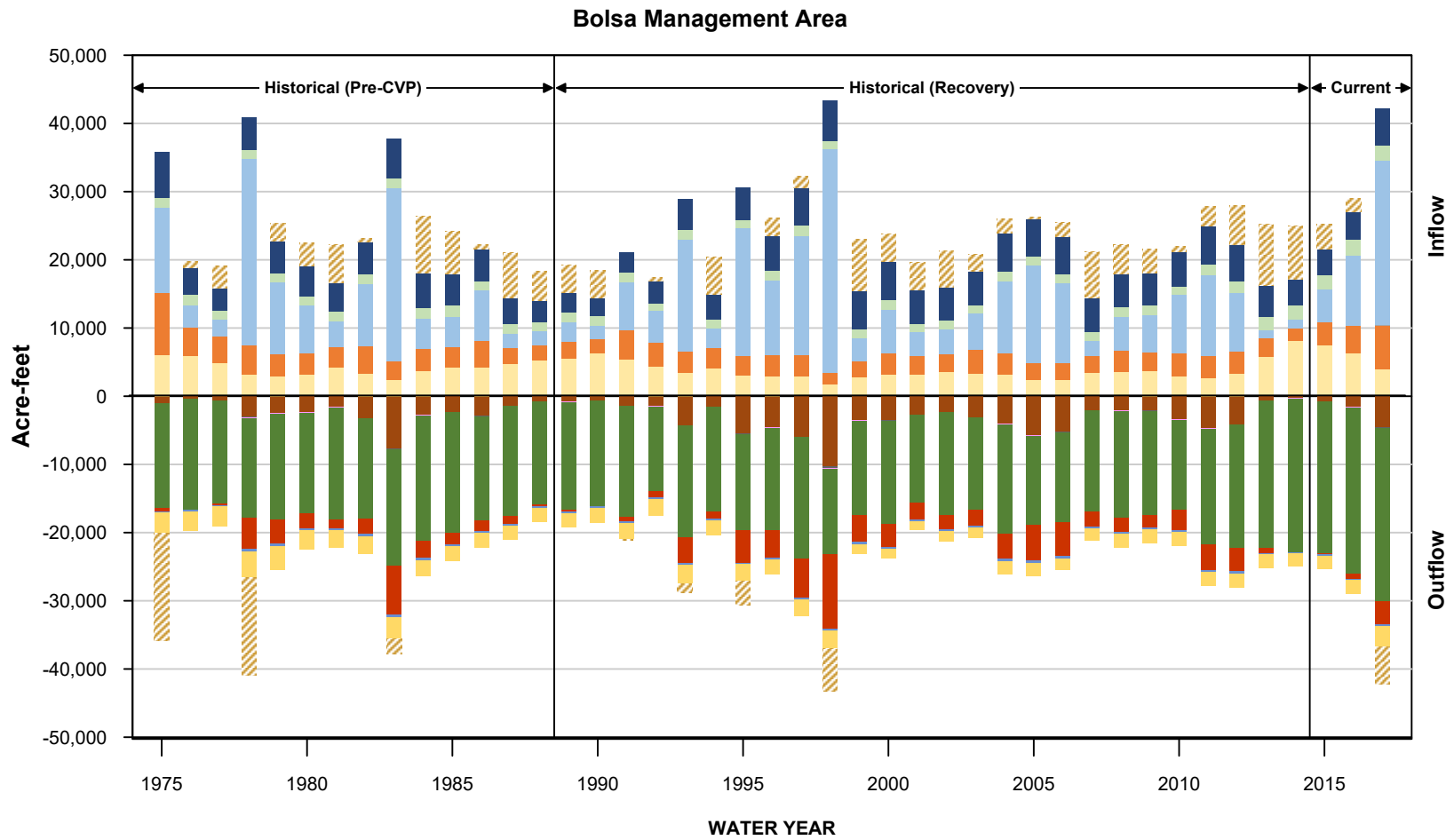
- Storage Change

November 2021

TODD GROUNDWATER

Figure 5-10
Historical and Current Groundwater Inflows and Outflows San Juan MA

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure5-10 Water Balance San Juan Management Area.gpj



Inflows

- Inflow from Hollister and San Juan MAs
- Reclaimed water percolation
- Irrigation deep percolation
- Dispersed recharge from rainfall
- Bedrock inflow
- Percolation from streams
- Subsurface inflow from external basins

Outflows

- Shallow discharge to streams
- Subsurface outflow to external basins
- Wells - M&I and domestic
- Wells - agricultural
- Groundwater discharge to streams
- Riparian evapotranspiration
- Outflow to San Juan MA

- Storage Change

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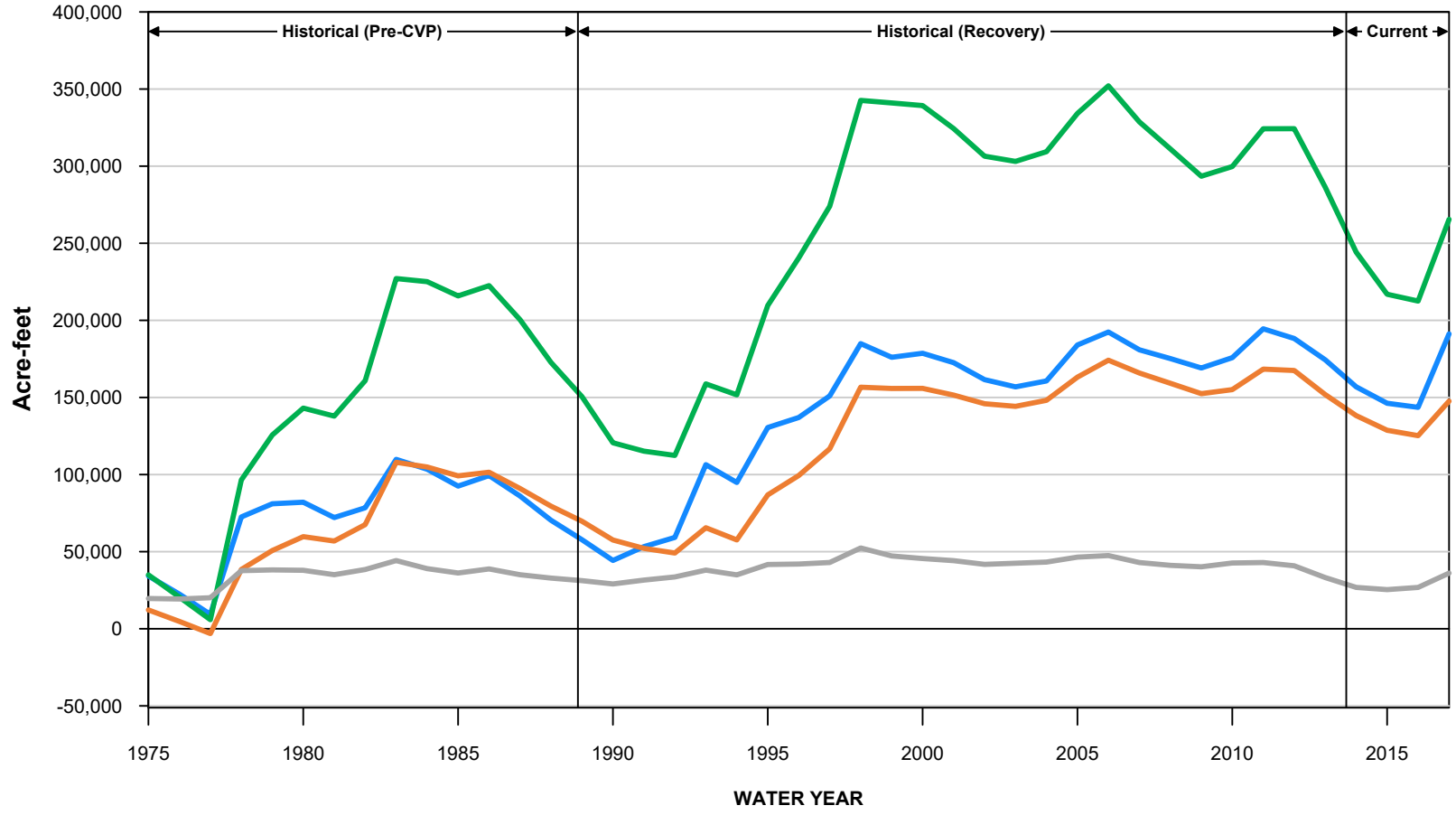
TODD GROUNDWATER

Figure 5-11
Historical and Current Groundwater Inflows and Outflows Bolsa MA

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure5-11 Water Balance Bolsa Management Area.gpj



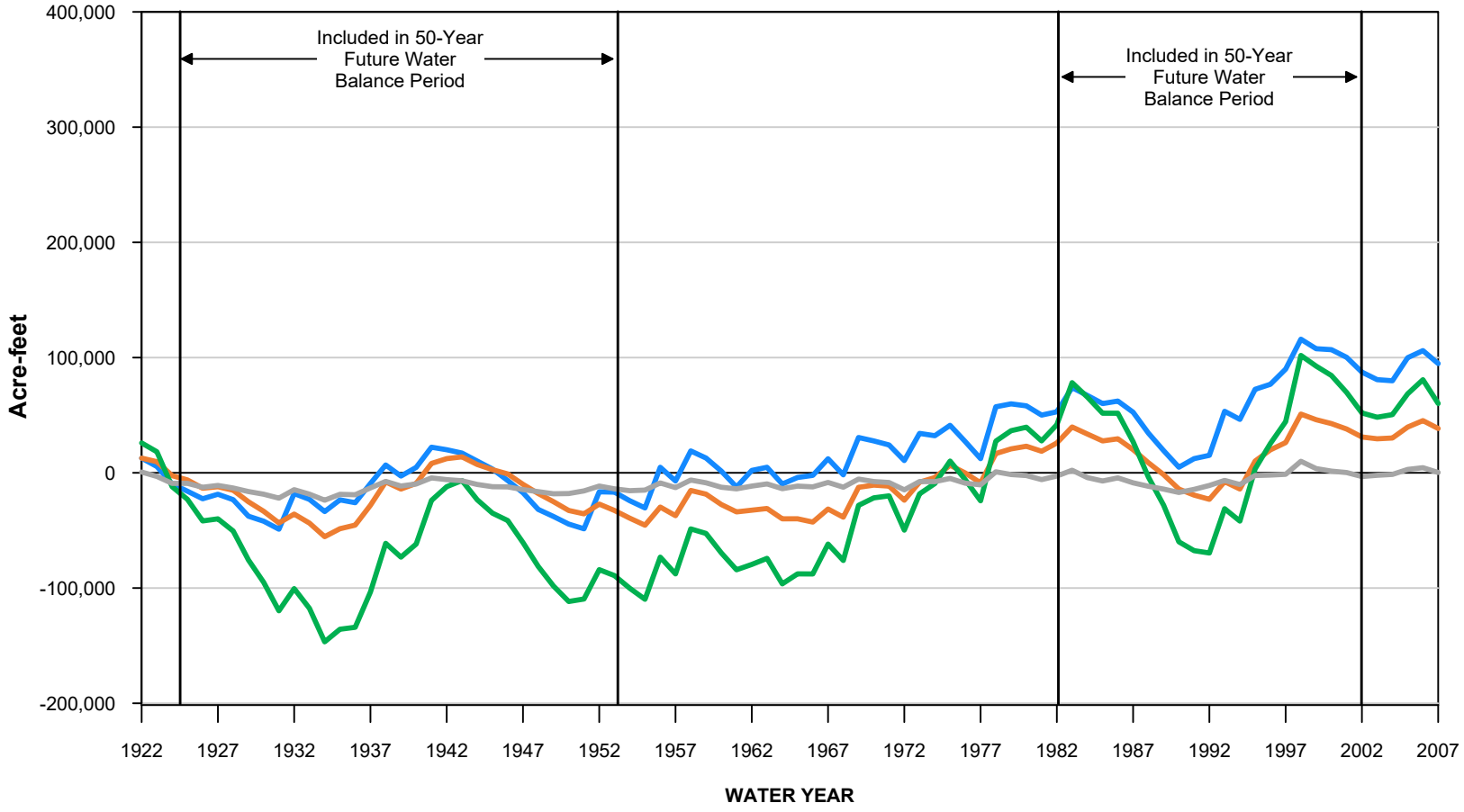
Bolsa Management Area
Hollister Management Area
San Juan Management Area
Southern Management Area

November 2021

TODD GROUNDWATER

Figure 5-12
Historical and Current Cumulative Change in Storage

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure5-12 Change in Storage.gpj



Bolsa Management Area
Hollister Management Area
San Juan Management Area
Southern Management Area

November 2021

TODD GROUNDWATER

Figure 5-13
Future Cumulative Change in Storage

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure5-13 Future Change in Storage.gpj

6. SUSTAINABLE MANAGEMENT CRITERIA

The Sustainable Groundwater Management Act (SGMA) defines sustainable management as the use and management of groundwater in a manner that can be maintained without causing *undesirable results*, which are defined as significant and unreasonable effects caused by groundwater conditions occurring throughout the basin:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply.
- Significant and unreasonable reduction of groundwater storage.
- Significant and unreasonable seawater intrusion.
- Significant and unreasonable land subsidence that substantially interferes with surface land uses.
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

For these sustainability indicators[6], a Groundwater Sustainability Plan (GSP) must develop quantitative sustainability criteria that allow the Groundwater Sustainability Agencies (GSAs) to define, measure, and track sustainable management. These criteria include the following:

- Undesirable Result – significant and unreasonable conditions for any of the six sustainability indicators.
- Minimum Threshold (MT[7]) – numeric value used to define undesirable results for each sustainability indicator.
- Measurable Objective (MO) – specific, quantifiable goal to track the performance of sustainable management.
- Interim Milestone – target value representing measurable groundwater conditions, in increments of five years, set by the GSAs as part of the GSP.

Together, these sustainability criteria provide a framework to define sustainable management, delineate between favorable and unfavorable groundwater conditions, and support quantitative tracking that identifies problems promptly, allows assessment of management actions, and demonstrates progress in achieving the goal of sustainability.

[6] If one or more undesirable results can be demonstrated as not present and not likely to occur, a GSA is not required to establish the respective sustainability criteria per GSP Regulations §354.26(d); in the inland North San Benito Basin seawater intrusion is not present and not likely to occur.

[7] The abbreviations for Minimum Threshold (MT) and Measurable Objective (MO) are provided because these terms are used often; however, the full unabbreviated term is used when helpful for clarity or when included in a quotation.

6.1. Sustainability Goal

The sustainability goal can be described as the mission statement of the GSAs for managing the basin; it embodies the purpose of sustainably managing groundwater resources and reflects the local community's values—economic, social, and environmental. The sustainability goal for the North San Benito Groundwater Basin, stated below, was developed through discussion at several public meetings of the Technical Advisory Committee (TAC) and at the March 24, 2020 public workshop.

6.1.1. Description of Sustainability Goal

The goal of the GSAs in preparing this GSP is to sustain groundwater resources for the current and future beneficial uses of the North San Benito Basin in a manner that is adaptive and responsive to the following objectives:

- to provide a long-term, reliable, and efficient groundwater supply for agricultural, domestic, and municipal and industrial uses
- to provide reliable storage for water supply resilience during droughts and shortages
- to protect groundwater quality
- to prevent subsidence
- to support beneficial uses of interconnected surface waters, and
- to support integrated and cooperative water resource management.

This goal is consistent with SGMA and is based on information from the Plan Area, Hydrogeologic Conceptual Model, Groundwater Conditions, and Water Balance sections that:

- Identify beneficial uses of North San Benito Basin groundwater and document the roles of local water and land use agencies.
- Describe the local hydrogeologic setting, groundwater quality conditions, groundwater levels and storage, and inflows and outflows of the basin.
- Document the ongoing water resource monitoring and conjunctive management of groundwater, local surface water, recycled water, and especially imported water sources that help protect groundwater quality and maintain water supply.

6.1.2. Approach to Sustainability Indicators

The approach to assessing the sustainability indicators and setting the sustainability criteria has been based on 1) review of available information from the Plan Area, Hydrogeologic Conceptual Model, Groundwater Conditions, and Water Balance sections of the GSP and 2) discussions with North San Benito stakeholders and local agency representatives, for example at TAC meetings and workshops.

This approach has developed since mid-2018 and generally began with definition of what an undesirable result is; this initially has been exploratory and qualitative and based on plain-language understanding of what *undesirable* means. Potential minimum thresholds have been explored in terms of when, where, how long, why, under what circumstances, and what beneficial use is adversely affected. This step identified seawater intrusion as not present and not likely to occur.

Beyond a qualitative identification of undesirable, the approach to defining sustainability indicators varies among the undesirable results. Several of the undesirable results are directly or indirectly related to groundwater levels, including conditions related to groundwater storage, subsidence, and interconnected surface water. The definition began in terms of groundwater levels in individual wells but has recognized that storage depletion, subsidence, and impacts on connected surface water occur as water levels decline. As a result, the sustainability criteria for those indicators are interrelated across space and time, coordinated and as consistent as is reasonable and as available data allow.

The consideration of the causes and circumstances of undesirable results is an important one in North San Benito particularly for groundwater quality because general mineral quality (e.g., total dissolved solids (TDS), iron and manganese, boron, etc.) is naturally poor throughout much of the basin and has been poor for decades. Sustainable management is all about use and management of groundwater without *causing* undesirable results but does not necessarily include reversing natural undesirable conditions. Moreover (per SGMA §10727.2(b)(4)), a GSP may but is not required to address undesirable results that occurred before and have not been corrected by the SGMA benchmark date of January 1, 2015.

While native groundwater quality is poor, salt and nitrate loading are recognized as potential sources of groundwater quality deterioration throughout much the basin. Such loading has been occurring for more than 100 years, however changes in groundwater quality at depth (where groundwater typically is pumped) will lag behind the salt and nutrient loading at the ground surface by decades to centuries. This means that groundwater quality monitoring data can be misleading, sustainability criteria potentially could be reactive to decades-old land use conditions and insensitive to the future, and the effects of management activities will not be seen for decades. Given all that, implementation of management actions is recognized as needed and such actions will be helpful in the long term.

Another important aspect to defining sustainability criteria has been considering what we know and more importantly what we do not know about undesirable results that may be detected or may potentially occur in North San Benito. From a big picture perspective, the North San Benito Basin is demonstrably well managed—historical groundwater level declines and overdraft have been reversed, subsidence generally has not been perceived, groundwater storage has been managed such that recent drought impacts have been minimized, significant local groundwater quality degradation due to wastewater disposal is being reversed, and inter-connected surface water and Groundwater-dependent ecosystems (GDEs) are being maintained. While water resource monitoring has been useful and adaptive, significant data needs and uncertainties exist. Because groundwater conditions are regarded generally as good and because considerable uncertainties exist, the process of setting sustainability criteria has been directed toward open discussion of uncertainties, in-depth identification of data needs and the means to fill them, and a strong intention for flexibility and adaptive management.

The intent is to quantify and qualify sustainability criteria such that they guide good management without setting off false alarms or triggering costly, ineffective, or harmful management actions.

6.1.3. Summary of Sustainable Management Criteria

This section documents the six sustainability criteria as relevant to North San Benito Basin and as guided by the Sustainability Goal. As documented in this section, the basin has been and is being managed sustainably relative to all criteria (except seawater intrusion, which is not relevant). Accordingly, sustainability does not need to be achieved, but it does need to be maintained through the planning and

implementation horizon. This will involve continuation and improvement of existing management actions—most notably import of Central Valley Project (CVP) water and its conjunctive use with groundwater. It also will include improvement and expansion of management actions and monitoring; these are addressed for each sustainability criterion's Measurable Objective in a subsection, Discussion of Monitoring and Management Measures to be Implemented.

While the North San Benito Basin has been managed sustainably, the following sustainability criteria are defined in this section because potential exists for undesirable results.

- The Minimum Threshold relative to **chronic lowering of groundwater levels** is defined at designated Key Wells by historical groundwater low levels adjusted to provide reasonable protection to nearby wells. Undesirable results are indicated when two consecutive exceedances occur in each of two consecutive years, in 60 percent or more of the Key Wells (e.g., three of five wells) in each Management Area. The Measurable Objective is to maintain groundwater levels above the MTs and to maintain groundwater levels within the historical operating range.
- The Minimum Threshold for **reduction of storage** for all Management Areas is fulfilled by the minimum threshold for groundwater levels as proxy. The Measurable Objective for storage is fulfilled by the MT for groundwater levels, which maintains groundwater levels within the historical operating range.
- The Minimum Threshold for **land subsidence** is defined as a rate of decline equal to or greater than 0.2 feet in any five-year period. This has been considered in terms of a potential cumulative decline equal to or greater than one foot of decline since 2015; 2015 represents current conditions and the SGMA start date. The extent of cumulative subsidence across the basin will be monitored and evaluated using InSAR data. Subsidence is closely linked to groundwater levels and it is unlikely that significant inelastic subsidence would occur if groundwater levels remain above their minimum thresholds.
- The Minimum Thresholds for **degradation of water quality** address nitrate and TDS for each MA. The MT for nitrate is defined initially as the percentage of wells with concentrations exceeding the nitrate Maximum Contaminant Limit (MCL) (45 mg/L) based on current conditions (2015-2017). The MT for TDS is defined initially as the percentage of wells with concentrations exceeding the TDS value of 1,200 mg/L based on current conditions. The Measurable Objectives for both are defined as maintaining or reducing the percentage of wells with median concentrations exceeding the MTs.
- The Minimum Threshold for **depletion of interconnected surface water** is the amount of depletion associated with the lowest water levels during the 1987-1992 drought, with some adjustments made for wells with groundwater levels lower in 2016 than in 1992. Undesirable results would occur if more than 25 percent of monitored wells within 1 mile of a shallow water table reach along the Pajaro River, Pacheco Creek, San Benito River, or Tres Pinos Creek had static spring water levels lower than the lowest static spring water level during 1987-1992.

6.2. Chronic Lowering of Groundwater Levels

Chronic lowering of groundwater levels can indicate significant and unreasonable depletion of supply, causing undesirable results to domestic, agricultural, or municipal groundwater users if continued over the planning and implementation horizon. As a clarification, drought-related groundwater level declines are not considered chronic if groundwater recharge and discharge are managed such that groundwater levels recover fully during non-drought periods.

Declining groundwater levels directly relate to other potential undesirable effects (for example regarding groundwater storage, land subsidence and interconnected surface water); these are described in subsequent sections. Effects on well users are described here.

Groundwater elevation trends in North San Benito Basin are documented in Groundwater Conditions Section 4.1; hydrographs of representative wells are presented for each MA. North San Benito is not characterized by overdraft with widespread chronic groundwater level declines. However, long-term hydrographs (e.g., **Figure 4-3**) show historical overdraft that was reversed in the late 1980s and early 1990s with importation of CVP water. Since that time, groundwater levels in broad areas of the basin (e.g., in Hollister and San Juan MAs) have been maintained at relatively high levels because of the availability of CVP supply. In addition, while groundwater level declines still occur with dry and critically-dry years, recent drought-related declines in these areas have not been as rapid or deep as in previous droughts. Other areas of the North San Benito Basin, including portions of Bolsa and Southern MAs, experienced record lows during the most recent drought. However, San Benito County was not marked by reports of significant water level decline impacts to shallow production wells.

6.2.1. Description of Undesirable Results

As groundwater levels decline in a well, a sequence of increasingly severe undesirable results will occur. These include an increase in pumping costs and a decrease in pump output (in gallons per minute). With further declines, the pump may break suction, which means that the water level in the well has dropped to the level of the pump intake. This can be remedied by lowering the pump inside the well, which can cost thousands of dollars. Chronically declining water levels will eventually drop below the top of the well screen. This exposes the screen to air, which can produce two adverse effects. In the first, water entering the well at the top of the screen will cascade down the inside of the well, entraining air; this air entrainment can result in cavitation damage to pump. The other potential adverse effect is accelerated corrosion of the well screen. Corrosion eventually creates a risk of well screen collapse, which would likely render the well unusable. If water levels decline by more than about half of the total thickness of the aquifer (or total length of well screen), water might not be able to flow into the well at the desired rate regardless of the capacity or depth setting of the pump. This might occur where the thickness of basin fill materials is relatively thin. While describing a progression of potential adverse effects, at some point the well no longer fulfills its water supply purpose and is deemed to have “gone dry.” For the purposes of this discussion, a well going dry means that the entire screen length (to the bottom of the deepest screen) is unsaturated.

For purposes of setting a Minimum Threshold, undesirable results are defined as a well going dry. This appears to be a low standard and not protective of private wells; but this is an initial definition to start the analysis. The rationale is summarized as follows with more explanation in the following sections:

- Accurate information on the location, elevation, status, and construction of most local supply wells is not readily available for detailed consideration of the range of adverse effects; analysis was initiated with the simple concept of exposure of the entire screen length, "going dry."
- During the recent drought, reports were lacking of shallow production wells going dry because of drought conditions; because of this, some flexibility exists for purposes of analysis. No private wells have been reported to have water shortages in the California Department of Water Resources (DWR) led *Household Water Supply Shortage Reporting System* (DWR 2021).
- Responsibility for potential undesirable results to shallow wells is shared between a GSA and a well owner; there is a reasonable expectation that a well owner would construct, maintain, and operate the well to provide its expected yield over the well's life span, including droughts.
- As discussed below, MTs are initially set at historical groundwater level lows and then adjusted upward to be protective.

6.2.2. Potential Causes of Undesirable Results

For North San Benito Basin, the primary potential cause of groundwater level undesirable results would be reduction of surface water supplies and associated reduction in groundwater recharge (in lieu and direct). This would potentially include disruption of Hernandez Reservoir releases for recharge that could have direct consequences for the Southern, Hollister, and San Juan MAs. More significantly, reduction of imported CVP water could have direct adverse impacts on agricultural and municipal water users in Hollister and San Juan MAs and serious overdraft impacts on groundwater users throughout Hollister, San Juan, and Bolsa MAs. Undesirable results also can occur because of increased demand for groundwater that exceeds available supply; this is most problematic in portions of North San Benito that do not have access to developed surface water supplies (i.e., areas not in Zone 3 or Zone 6).

Given that the North San Benito Basin is not characterized by basin-wide chronic groundwater level declines, then the undesirable results of a well losing yield, having damage, or "going dry" represent a more complex interplay of causes and shared responsibility.

Some of the potential causes are within GSA responsibility; most notably, a GSA is responsible for groundwater basin management without causing undesirable results such as chronic groundwater level declines. SGMA also requires that a GSA address significant and unreasonable effects caused by groundwater conditions *throughout the basin.* This indicates that a GSA is not solely responsible for local or well-specific problems and furthermore that responsibility is shared with a well owner. A reasonable expectation exists that a well owner would construct, maintain, and operate the well to provide its expected yield over the well's life span, including droughts, and with some anticipation that neighbors also might construct wells (consistent with land use and well permitting policies). In North San Benito, some concern exists that some recent wells might be relatively shallow because they were constructed during a period when groundwater levels have been maintained at relatively high levels.

6.2.3. Definition of Undesirable Results

As context, the North San Benito Sustainability Goal has the objective to provide a long-term, reliable, and efficient groundwater supply for agricultural, domestic, and municipal and industrial uses.

In that light, the definition of undesirable results would be the chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. This is defined by groundwater conditions occurring throughout the basin, with

a focus on wells in the North San Benito Basin. This definition also recognizes that chronic lowering of groundwater levels could affect groundwater flow to or from the hydraulically connected Llagas Subbasin, and thereby potentially affect their ability to maintain sustainability.

As documented in Groundwater Conditions Section 4.1, analysis of hydrographs reveals that North San Benito County is not characterized by basin-wide chronic groundwater level declines. While affected at times by drought, groundwater levels in broad areas of the basin have been maintained at relatively high levels because of the availability of CVP supply. Moreover, San Benito County has not been marked by reports of significant water level decline impacts to shallow supply wells. In the absence of reported well problems, it can be concluded that undesirable results for the chronic lowering of water levels are not occurring in North San Benito and that the basin is managed sustainably relative to groundwater levels. This finding is consistent with the water budget analyses for the MAs that indicate (within the range of uncertainty) balanced inflows and outflows into the future.

6.2.4. Potential Effects on Beneficial Uses and Users

Groundwater is the major source of supply in the GSP Area and supplies wells for agricultural, municipal, industrial, and domestic beneficial uses. Groundwater has been and is being used for the range of beneficial uses, even during drought, and with reasonable operation and maintenance by well owners.

6.2.5. Sustainable Management Criteria for Groundwater Levels

The general approach to defining sustainability criteria (minimum thresholds and measurable objectives) for groundwater levels has involved selection of representative monitoring wells (Key Wells), review of groundwater level data, and review of supply well location/construction information to gage potential undesirable effects on wells. Specifically, this has included evaluating historical low levels in Key Wells. This approach is founded on the idea that undesirable results were not reported when groundwater elevations were at their minimum values and therefore returning to those minima should not cause undesirable results in the future. However, the approach also recognizes that some wells did not exist at the time of historical lows (e.g., in the late 1970s), were not constructed to operate effectively under such conditions, and could be at risk with future low-water levels.

6.2.5.1. Selection of Key Wells

The approach includes selection of existing wells in the San Benito County Water District (SBCWD) monitoring program to represent nearby supply wells. Sustainability criteria would be defined for each of these Key Wells and each would be monitored for groundwater levels with respect to MTs and MOs. The Key Wells have been identified by reviewing groundwater level hydrographs from all currently monitored wells and selecting wells that have a long, reliable, and recent record of groundwater level monitoring, that represent local or regional trends, and that together provide a broad geographic distribution for each Management Area and the Basin as a whole. The distribution of these wells also has been reviewed with respect to maps showing density of wells across the Basin (e.g., **Figure 2-2**). These wells are production wells, which is not optimal for monitoring; on the other hand, they are generally representative of production wells.

Groundwater level data and hydrographs of each Key Well have been reviewed to identify the all-time lowest groundwater elevation at each Key Well. As discussed in Groundwater Conditions Section 4.1.3, historical minima in many wells occurred in the late 1970s and early 1980s, but in some areas (e.g., Southern MA), the historical lows were recorded with the most recent drought.

The identified historical low at each Key Wells (i.e., historical maximum depth to water) represents the first approximation of a minimum threshold, with the realization that the final selection of the MT for a Key Well could be adjusted upward to be more protective of nearby supply wells.

6.2.5.2. Evaluation of Existing Wells with Construction Information

Figure 6-1 shows the locations of the selected Key Wells along with locations of existing supply wells in their vicinity. Each of the existing wells (shown on the map as a colored dot) has a known location and elevation, and documented construction details in a District database. These wells are relatively recent and can be presumed to be active supply wells; they have been analyzed as a basis to refine the MTs.

By way of background, information on local supply wells has been recorded on Water Well Drillers Reports and is available mostly as paper or scanned copies. However, accurate data on the location and elevation of most wells is not available and the status of many (older) wells is not known. In addition, construction information on most wells has not been entered into databases where it can be analyzed readily. This represents a data need that was evaluated early in this GSP process, with a subsequent effort focused on SBCWD well record files; SBCWD has been the well permitting agency in San Benito County since 2004 and its files contain considerable information including well locations by Assessor's Parcel Number (APN). This effort involved accurately locating wells (many of which are shallow domestic wells) and digitizing the respective construction information.

As a result, accurate digitized data are now available for 169 wells across the basin; these are the wells shown as colored dots on **Figure 6-1**. As noted previously, these wells are recent, may be presumed to be active, and—because they were drilled after basin recovery—may be relatively shallow. Accordingly, these wells are deemed to be representative of other existing wells (without known construction information) and to be protective with regard to groundwater level declines. In brief, these existing 169 wells have been assigned to the closest Key Well as indicated by the color groupings. Well assignments have been made without respect to MA boundaries (for example, see Southern-Hollister MA boundary). This helps to make sure that minimum thresholds in each MA are protective of neighboring MAs.

As discussed in Sections 6.2.1 and 6.2.2, groundwater level declines involve a continuum of potential impacts that range from those effects not noticed by the well owner to those that are noticed and reasonably handled by the well owner. For purposes of this GSP, unreasonable results occur when a well goes dry, in other words, the entire screen length (to the bottom of the deepest screen) is unsaturated.

For each of the 22 groupings of wells around the key wells, the bottom of screens for the wells was then compared with the historical low groundwater level in the respective Key Well (i.e., maximum depth to groundwater in feet below ground surface). This allowed enumeration of how many wells theoretically would go dry at that historical low level, followed by adjustment upward of this first-approximation MT level until almost no wells go dry. Justification of the adjustments include the following:

- Upward modification in part of the Bolsa MA with few candidate Key Wells and existing wells with construction information, to address the increased uncertainty about potential impacts.
- Upward modification in areas of the historical Hollister pumping depression, recognizing that groundwater levels are unlikely to be so deep, given reasonable CVP supply.
- Upward adjustment to be protective in the San Juan Economically Disadvantaged Area.

Table 6-1 presents the MT levels for each of the 22 Key Wells and summarizes the potential effects on the 169 nearby wells with construction information. As shown, 5 of 169 wells (3%) are predicted to go

dry (as defined herein) if groundwater levels in the Key Wells decline to the upward-adjusted low levels. It is emphasized that such predictions are based solely on the limited available data, analysis, and assumptions described above and are not intended to represent projections into the future. As noted, reports of wells historically going dry are lacking despite recent drought; future improvements in monitoring and data are discussed in Section 7 Monitoring Network.

6.2.6. Minimum Thresholds

According to GSP Regulations Section 354.28(c)(1) the minimum threshold for chronic lowering of groundwater levels must be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. MTs for chronic lowering of groundwater levels are to be supported by information on the rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin. However, as documented in the Groundwater Conditions Section 4.1.3, groundwater levels are not chronically declining in North San Benito. While groundwater levels decline in dry and critically-dry years, they have recovered in normal, above normal, and wet years. Groundwater levels in several Southern Area Key Wells were at historical lows after 2015 (thereby defining the respective MT) but all have since recovered.

Under current conditions, groundwater levels in Key Wells are above the MTs and no undesirable results are known to occur. Nonetheless, MTs have been developed because the potential exists for chronic lowering of groundwater levels.

Using recent and reliable information on the construction of existing supply wells, the MT levels shown in **Table 6-1** are protective of most supply wells, based on available information. The MTs are based on historical low groundwater levels or levels that are higher. Because of this, the MTs are not only protective of local wells but also would help minimize potential impacts on groundwater flow to or from other area, such as Llagas Subbasin. Based on historical lows, the MTs account for historical groundwater level variations, and consideration has been given to supporting basin management flexibility, for example to avoid setting off false alarms or triggering costly, ineffective, or harmful management actions. However, MTs have been not adjusted downward at this time, although periods of record for some groundwater level hydrographs are short and may not include actual historical lows that could recur.

Table 6-1. Minimum Thresholds for Groundwater Levels

Key Well	MA	Historical Maximum Depth to Water (ft-bgs*)	Bottom of Deepest Well Screen in Shallow Nearby Wells with Construction Information (ft-bgs)	Minimum Threshold Depth to Water in Key Well (ft-bgs)	Reason for Adjustment to Reduce Potential Impacts	Nearby Wells with Construction Information	
						Number of Impacted Wells / Total Nearby Wells	Percent of Wells Impacted
11-4-25H2	Bolsa	153.22	148	145	Few nearby wells, uncertain impacts	0 / 3	0%
11-5-21E2	Bolsa	63	180	63	No change	0 / 2	0%
11-5-28B1	Bolsa	102	150	102	No change	0 / 8	0%
12-5-06L1	Bolsa	176.5	580	176	Rounded	0 / 1	0%
12-5-17D1	Bolsa	185	300	185	No change	0 / 4	0%
11-5-13D1	Hollister	97	160	97	No change	0 / 2	0%
11-5-35G1	Hollister	104	100	104	No change	1 / 18	6%
12-5-03B1	Hollister	96	440	96	No change	0 / 2	0%
12-5-24N1	Hollister	280	140	160	Area of historical pumping depression	2 / 24	8%
12-5-34P1	Hollister	153	120	150	Area of historical pumping depression	2 / 26	8%
12-6-06L4	Hollister	64	120	64	No change	0 / 20	0%
13-6-19K1	Hollister	109	140	109	No change	0 / 9	0%
12-4-17L20	San Juan	47.5	200	47	Rounded	0 / 6	0%
12-4-26G1	San Juan	152.5	180	152	Rounded	0 / 14	0%
13-4-01K1	San Juan	75	NA	75	No change	0 / 0	0%
13-4-03H1	San Juan	185	157	155	Economically Disadvantaged Area	0 / 7	0%
Rider Berry	San Juan	111.4	180	110	Rounded	0 / 2	0%
Donati 2	Southern	59.74	400	59	Rounded	0 / 1	0%
Ridgemark 5	Southern	45.15	335	45	Rounded	0 / 1	0%
Ridgemark 7	Southern	136.45	200	136	Rounded	0 / 2	0%
Schields 4	Southern	73.74	215	73	Rounded	0 / 2	0%
Wildlife Center 5	Southern	79.74	97	79	Rounded	0 / 15	0%
TOTAL						**5 / 169**	**3%**

*ft-bgs: feet below ground surface

The MTs shown in **Table 6-1** were developed making good use of available data. However, data needs exist and thus the MTs include some uncertainty as summarized below:

- The geographic distribution of wells in the groundwater level monitoring program is uneven. While broad "blank" areas on **Figure 6-1** generally are areas with few wells anyway (supply or monitoring), additional Key Wells would be beneficial.
- Current Key Wells are production wells that were not sited or designed for monitoring and may not be accurately representative of nearby supply wells as a matter of short historical record, distance, topographic, and groundwater gradients between the Key Well and supply well, or respective screen settings.
- Information on vertical groundwater gradients is lacking and groundwater levels in shallow wells may not be represented adequately by relatively deep Key Wells.
- The specific location, status, and construction of most existing private wells is not known, or the information is not readily available (in databases).

These data needs have been recognized and are being addressed in this GSP as follows:

- Mapping and prioritization of geographic gaps in the monitoring program with subsequent identification of existing wells that can be added to the program.
- Installation of new dedicated monitoring wells as part of the Dedicated Monitoring Well Program (funded by a Sustainable Groundwater Management Round 3 Grant) with incorporation into the monitoring program; these are wells sited and designed to support the groundwater level monitoring program (among other objectives) and to become Key Wells.
- Continuation of the process to accurately locate existing supply wells and to digitize well information including construction.

The benefits of these efforts will accrue over the next few years and will support review and update of the MTs in the Five-Year GSP Update in 2027.

6.2.6.1. Minimum Thresholds and Criteria for Undesirable Results

Undesirable results are based on exceedances of MT levels and must be defined not only in terms of how they occur (see Section 6.2.2 Potential Causes of Undesirable Results), but also when and where. By definition, undesirable results are not just drought-related but chronic and are not just local but basin-wide.

The distinction between drought and chronic declines may not be clear when declines are occurring, particularly during drought when it is not known whether subsequent years will bring recovery. Moreover, effects of declining levels on individual well owners may be real problems, whether or not they represent basin-wide sustainability issues.

The SBCWD groundwater level monitoring program generally has been quarterly, with Valley Water (SCVWD) data sharing and with annual report preparation following the autumn monitoring event at the end of the water year. The annual report also provides information on climate, local surface water conditions, imported water availability, groundwater levels and storage, and in the future will document groundwater extraction. Accordingly, groundwater level monitoring and annual reporting provides an early warning system that allows response by the GSAs and local groundwater users. From this perspective, two consecutive exceedances in each of two consecutive years is regarded as indicating when an undesirable result is occurring. The exceedances would be measured at a Key Well as part of

the regular quarterly monitoring. It should be noted that GSA responses do not have to wait for two years and may involve a staged response as in urban water shortage contingency plans.

While undesirable results relate to groundwater conditions throughout the basin, the North San Benito Basin has been organized into four MAs. As discussed in Section 5.3, this reflects the fact that the Basin includes a 30-mile-long series of linked valleys and that MAs have distinct land use mixes, water supply sources, management, and groundwater level trends. Groundwater level MTs are established separately for each MA, because the groundwater histories are distinct, albeit linked. As a result, undesirable results could occur in one MA and not the others. At this time, the Key Wells are fairly distributed across the MAs (disregarding areas with few wells), but relatively few, and even within MA boundaries, could be responding more to local problems than MA-wide sustainability issues. Accordingly, undesirable results are indicated to be occurring in a MA when sixty percent or more of the Key Wells have had the two consecutive exceedances in each of two consecutive years.

To summarize for the North San Benito Basin:

> The **Minimum Threshold** for defining undesirable results relative to chronic lowering of groundwater levels is defined at each Key Well by historical groundwater low levels adjusted to provide reasonable protection to nearby existing wells. Undesirable results are indicated when two consecutive exceedances occur in each of two consecutive years, in sixty percent or more of the Key Wells in each Management Area.

6.2.6.2. Relationship of Minimum Threshold to Other Sustainability Indicators

The establishment of MTs also needs to consider potential effects on other sustainability indicators. These indicators are discussed later in this section; the following are brief discussions.

- **Groundwater Storage**. The MTs for groundwater levels are protective of groundwater storage. These MTs are defined in terms of historical groundwater low levels and groundwater storage has recovered since historical lows; it is not being depleted. Groundwater storage has changed, with drought-related declines followed by recovery. The major concern expressed in the Sustainability Goal is to have reliable storage for drought or storage; the MTs for groundwater levels will maintain groundwater levels and thus storage, too.
- **Seawater Intrusion.** There is no possibility of seawater intrusion in North San Benito. Accordingly, there is no seawater intrusion minimum threshold and no relationship with other minimum thresholds.
- **Subsidence.** Subsidence is closely linked to groundwater levels. It is unlikely that significant inelastic subsidence would occur if groundwater levels remain above historical levels, which have been used to define groundwater level MTs. Accordingly, the minimum threshold for groundwater levels is consistent with and supportive of the objective to prevent subsidence undesirable results.
- **Water Quality.** General relationships are recognized, for example that contaminants may be mobilized by changing groundwater levels or flow patterns. Maintenance of groundwater levels above historical low levels and within historical ranges would minimize any effects on maintenance of water quality at or above minimum thresholds. The groundwater quality issues

in North San Benito Basin are associated primarily with salt and nutrient loading and not likely to be affected by groundwater levels or flow within historical ranges.

- **Interconnected Surface Water.** The set of monitoring wells used to evaluate interconnected surface water overlaps with the set of Key Wells used for the groundwater levels minimum threshold. In general, the groundwater elevation MTs for interconnected surface water are similar to or higher than those for groundwater levels; the higher MTs would be controlling for spring quarterly measurements.

6.2.6.3. Effect of Minimum Threshold on Sustainability in Adjacent Areas

The Bolsa MA in the North San Benito Basin is adjacent to the Llagas Subbasin in Santa Clara County. Groundwater flows are generally south, from the Llagas Subbasin into the Bolsa MA, although there is evidence of occasional flows from the Bolsa MA into the Llagas Subbasin. (see Groundwater Conditions, **Figures 4-8** and **4-9**) with some drainage into the Pajaro River. The groundwater level MTs would support maintenance of groundwater levels above their respective MTs in Bolsa. This in turn will support maintenance of groundwater levels in Llagas Subbasin.

The North San Benito Basin is upstream of the Pajaro Valley Subbasin; the two are linked by flows in the Pajaro River. The MTs for the North San Benito Basin represent current conditions; establishment of MTs and maintenance of groundwater levels would not affect the ability of the Pajaro Valley GSA to achieve or maintain sustainability.

6.2.6.4. Effect of Minimum Threshold on Beneficial Uses and Users

Groundwater is the major source of supply in the GSP Area and supplies wells for agricultural, municipal, industrial, and domestic beneficial uses and users. The MTs are based generally on historical lows, which recognizes that groundwater has been and is being used reasonably for the range of beneficial uses even during drought, and with reasonable operation and maintenance by well owners. The MTs include upward adjustment to be more protective of relatively recent wells that may not have been constructed to operate under low-level historical conditions. The MTs quantify undesirable results as involving two consecutive exceedances in each of two consecutive years, which provides early warning of declining groundwater levels.

6.2.6.5. Relationship of Minimum Threshold to Regulatory Standards

No federal, state, or local standards exist for groundwater levels.

6.2.6.6. How Management Areas Can Operate without Causing Undesirable Results

The establishment of MTs has been consistently conceived and applied across all four Management Areas. MTs are based on historical low levels (with some adjustments), which did not occur at the same time across all MAs. Nonetheless, all represent maintenance of groundwater levels within a historical range during which the MAs have been managed without causing known undesirable results in other MAs.

6.2.6.7. How the Minimum Threshold will be Monitored

Monitoring for the groundwater levels MT will be conducted as part of the SBCWD quarterly groundwater level monitoring program, data, and analytical results are presented in the Annual Groundwater Reports. The SBCWD monitoring program includes wells in the Pacheco Valley in Santa Clara County; Valley Water (SCVWD) shares data from its monitoring in the Llagas Subbasin.

6.2.7. Measurable Objectives

Measurable Objectives are defined herein as an operating range of groundwater levels, allowing reasonable fluctuations with changing hydrologic and surface water supply conditions and with conjunctive management of surface water and groundwater. The groundwater level MTs represent the bottom of the operating range and are protective of well owners and groundwater users. The top of the operating range is generally where the water table approaches the soil zone and ground surface, except where groundwater and surface water are inter-connected, or groundwater dependent ecosystems exist. Section 6.7 addresses these areas and potential undesirable results with Depletions of Interconnected Surface Water. With these important exceptions, the top of the operating range is below the soil zone, thereby minimizing potential agricultural drainage problems.

> The **Measurable Objective** is to maintain groundwater levels above the groundwater level MTs (as quantified above or the interconnected surface water MTs, whichever is higher at the relevant measurement event), and to maintain groundwater levels within the operating range as defined in this section.

The relevant groundwater level MT values that numerically define the Measurable Objectives are listed in Tables 6-1 and 6-6. Groundwater conditions with respect to chronic groundwater level declines are already sustainable. Therefore, no interim milestones are needed to achieve sustainability by 2042.

6.2.7.1. Discussion of Monitoring and Management Measures to be Implemented

Data needs and sources uncertainties have been identified in this section, including for example, the lack of reliable and accessible information on private well construction and the uncertainties associated with using production wells for Key Wells. Monitoring improvements are discussed in Section 7 Monitoring Network, including results of the Dedicated Monitoring Well Program initiated in June 2020.

Management actions to maintain groundwater levels have been ongoing and effective for decades. These actions (consistent with the Sustainability Goal objective to support integrated and cooperative water resource management) have included developing local surface water for percolation, acquiring imported CVP water for direct use and managed aquifer recharge, providing recycled water for irrigation, and other conjunctive use operations. Relevant to this is the Managed Aquifer Recharge Study initiated in June 2020 and incorporated into Section 8 Projects and Management Actions. SBCWD also has education and outreach programs to promote water use efficiency and to reduce water demand.

In addition, to minimize construction of new wells with insufficient well depth, SBCWD will provide outreach to local well drillers and prospective well owners, for example, through its website and well permitting process. Such outreach will inform well drillers about the MTs for groundwater levels. This will likely involve description of the MTs and Key Wells, provision of information (for example, a general map of MT depths to water) to guide well drillers, and explanation of the potential risks of shallow wells.

6.3. Reduction of Groundwater Storage

Groundwater storage is the volume of water in the basin[8]; it provides a reserve for droughts or surface water supply shortages. The minimum threshold for reduction of groundwater storage is the volume of groundwater that can be withdrawn from a basin or management area without leading to undesirable results. Undesirable results would involve insufficient stored groundwater to sustain beneficial uses through drought or shortage. The storage criteria are closely linked to groundwater levels, but unlike the other sustainability criteria, the reduction of groundwater storage criteria is not defined at individual monitoring sites but is evaluated as a volume on a management area or basin-wide basis. The sustainability indicator for groundwater storage addresses the ability of the groundwater basin to support existing and planned beneficial uses of groundwater even during drought and surface water supply shortage.

Change in groundwater storage (either reduction or increase) can be evaluated with two main methodologies; one method uses groundwater level change data from wells with application of a storage coefficient and the other method involves an accounting of all the inflows and outflows and computation of change in storage according to the water budget equation (inflows-outflows=change in storage).

For the management areas of the North San Benito Basin, the water budget has been calculated using the numerical model, as described in Water Balance Section 5. In brief, this has included analyses of the cumulative change in storage for each of the MAs for the historical and current period, 1975-2017, and for simulated future conditions (see **Figures 5-12** and **5-13**). The water budget analyses have shown the effects of drought and shortage and the subsequent recoveries; these indicate that groundwater storage in North San Benito Basin has not been reduced and that the basin is sustainably managed relative to storage. The water budget inflows and outflows have been balanced over the long term; furthermore, as indicated in Section 6.2, water supply wells have not been reported as going dry in North San Benito Basin.

6.3.1. Description of Undesirable Results

Given that North San Benito Basin has a balanced water budget without long-term storage reduction, the undesirable result associated with inadequate groundwater storage would be an insufficient supply to support beneficial uses during droughts. Storage is related to groundwater levels, thus, undesirable results associated with storage would likely be accompanied by one or more undesirable results associated with groundwater levels, including reduced well yields, subsidence, and depletion of interconnected surface water.

6.3.2. Potential Causes of Undesirable Results

For groundwater storage in North San Benito Basin, the basic cause of undesirable results would be an imbalance of the water budget, such that outflows exceed inflows resulting in reduction of groundwater storage. This imbalance could be caused in turn by reduced surface water supplies and associated groundwater recharge (in lieu and direct). Such reduction could potentially include 1) disruption of

[8] This terminology is consistent with GSP Regulations, recognizing that the amount of groundwater *in* storage is the key variable and is distinct from groundwater storage capacity.

Hernandez Reservoir releases (with direct consequences for the Southern, Hollister, and San Juan MAs) or 2) reduced CVP water imports with direct adverse impacts on agricultural and municipal water users in Hollister and San Juan MAs and serious overdraft impacts on groundwater users throughout Hollister, San Juan, and Bolsa MAs. Undesirable results also could occur because of changes in land use causing increased demand for groundwater; this would be most problematic in portions of North San Benito without access to developed surface water supplies (i.e., areas not in Zone 3 or Zone 6).

6.3.3. Definition of Undesirable Results

Undesirable results are defined in light of the Sustainability Goal for the North San Benito Basin, which includes an objective to provide reliable storage for water supply resilience during droughts and shortages. Accordingly, the definition of potential undesirable results for storage reduction includes consideration of how much storage has been used historically (i.e., operating storage) and how much stored groundwater reserve is needed to withstand drought.

In thinking about conceptual operating storage or groundwater reserves, it is important to bear in mind that these are not the total amount of groundwater that could potentially be extracted from the basin. Most wells are in the range of 150 to 500 feet deep. The basin is hundreds of feet thick in most places, and up to 4,000 feet in some places (see Section 3.8). Additional groundwater storage could be utilized, with the foremost assumption that withdrawals and reduction are followed by commensurate recharge and recovery. This could occur as part of enhanced conjunctive use programs.

6.3.4. Potential Effects on Beneficial Uses and Users

Groundwater is the major source of supply in the GSP Area and supplies wells for agricultural, municipal, industrial, and domestic beneficial uses. Reduction of groundwater storage would reduce access to that supply with adverse effects on the community, economy, and environmental setting of North San Benito. However, groundwater has been and is being used for the beneficial uses, even during drought.

6.3.5. Sustainable Management Criteria for Groundwater Storage

The general approach to defining sustainability criteria for groundwater storage has involved review of historical cumulative change in storage and expected future storage declines during droughts. Review of historical change in storage is revealing about how much storage has been used in each MA, effectively defining an *operating storage*. Similarly, examination of cumulative storage change for future baseline conditions is instructive about the *groundwater reserves* needed to withstand future droughts.

6.3.5.1. Description of Historical Cumulative Change in Storage: 1975-2017

Figure 6-2 shows the cumulative change in storage by management area for historical and current conditions (1975-2017) as simulated by the numerical model. Starting from an assigned value of zero at the end of 1974, the storage change in each year is added to the cumulative total of the preceding years. Wet periods appear as upward trends in the cumulative total and droughts appear as downward trends. Cumulative storage reached its minimum for all four MAs in 1977, because the 1976-1977 drought occurred shortly after the start of the simulation period. This was followed by periods of increasing storage reflecting wet years and/or CVP imports and decreasing storage due to droughts. The storage volume change over the historical period from 1975 through 2017 is an indication of the operating storage, namely how much storage has been utilized in the context of a sustainable water budget. Observations about the historical operating storage for each of the MAs are as follows:

Hollister MA. Groundwater storage accumulated from 1977 to 1983; this accumulated storage subsequently was tapped during the prolonged drought of 1987 through 1992 (six years). After 1992, storage accumulated rapidly with a series of mostly wet and above normal water year types and delivery of CVP water for direct use and for recharge. Accumulated storage reached a maximum of 352,000 AF in 2006. Severe drought (including CVP cutbacks) from 2012 through 2016 was marked by storage decrease. Storage declines associated with the major droughts were about 110,000 AF. Nonetheless, storage at the end of 2017 was 265,000 AF greater than in 1975.

San Juan MA. The pattern of cumulative storage change for San Juan MA is like that of Hollister MA but less in magnitude. San Juan MA is smaller in area than Hollister, did not have as large a historical pumping depression as Hollister MA, and therefore did not have as much storage capacity that could be filled. Accumulated storage reached a maximum of 174,000 AF in 2006. With a similar storage history as in Hollister MA, storage declines associated with the major droughts were about 45,000 AF. Overall, storage in 2017 was 148,000 AF more than in 1975.

Southern MA. As discussed in Water Balance Section 5.8, evaluation of storage change in the Southern MA is less certain because of the scarcity of data to correctly estimate the initial storage in 1975 as a starting point for the model simulation. Nonetheless, the rapid increase in storage during the 1990s realistically reflected wet years during that decade (no CVP water is delivered to this MA) and reached a maximum of 150,000 AF in 2011. The simulated response of Southern MA to recent drought is informative for future planning; the major drought of 2012 through 2016 was marked by storage loss of almost 51,000 AF. Despite drought declines, cumulative storage increased by 147,000 AF from 1990 through 2017.

Bolsa MA. In contrast to the other MAs, groundwater storage in the Bolsa MA remained relatively steady during 1975-2017, reflecting various factors including its fine-grained sediments and considerable groundwater inflows along the perimeter of the MA. Maximum cumulative storage was 52,000 AF in 1998. Response to drought has involved gradual storage declines; the major 2012-2016 drought was marked by storage loss of about 17,500 AF. While storage change overall was small in Bolsa MA, cumulative storage in 2017 was 36,000 AF greater than in 1975.

In all four MAs, simulated storage recovered during the 6 to 10 years following the droughts, indicating that the drought declines were within the operating storage and not a sign of overdraft.

6.3.5.2. Description of Cumulative Change in Storage: Future Baseline Conditions

Examination of cumulative storage change for future baseline conditions is instructive about groundwater reserves to withstand future droughts. Future changes in storage were obtained from the future baseline modeling, which was described in Water Budget Sections 5.2 and 5.4.3. That modeling simulates hydrologic conditions (including CVP availability) for an 86-year period corresponding to water years 1922-2007. It assumes a continuation of existing land use, urban water demand, water, and wastewater treatment and CVP availability. Most importantly, this simulation includes complete drought and recovery cycles for 1923-1934 and 1987-1992, which were the two largest historical droughts in terms of cumulative declines in water levels and storage. Water Balance Section 5.9 describes how the initial estimate of sustainable yield is based on the same future baseline simulation described here.

Figure 6-3 shows the cumulative change in storage for future baseline conditions as simulated by the numerical model. The large cumulative storage declines during 1923-1934 and 1987-1992 resulted from

concurrent decreases in rainfall recharge, stream percolation and CVP deliveries, accompanied by increased pumping to compensate for the reduction in CVP availability.

The largest simulated drought-related storage decline from the future baseline simulation is shown for each management area in **Table 6-2**; these are the "design droughts" for planning purposes. Also shown for comparison is the maximum cumulative storage increase after 1975. As illustrated in **Figure 6-2**, the maximum occurred in Hollister and San Juan MAs in 2006, in Bolsa in 1998, and in Southern MA in 2011. In all four management areas, maximum cumulative storage increase is 2.1 to 2.7 times greater than the largest anticipated storage decline during a future drought. There were minor differences among the MAs with respect to which drought period had the largest cumulative decline. The 1923-1934 decline was the largest for all of the areas except the Southern MA. In the Southern and Bolsa MAs, cumulative storage for the latter drought reached a minimum in 1990 instead of 1992.

Table 6-2. Groundwater Storage During Future Droughts

Management Area	Largest Simulated Future Drought		Maximum Cumulative Storage Increase from 1975, AF*	Ratio of Maximum Storage to Future Drought Decline
	Hydrologic Period	Cumulative Storage Decline, AF		
Hollister	1922 – 1934	165,000	352,000	2.1
San Juan	1922 – 1934	65,000	174,000	2.7
Southern	19–7 - 1990	57,000	150,000	2.6
Bolsa	1922 – 1934	21,000	52,000	2.5

*Except Southern MA, which was from 1990 to reduce uncertainty from lack of historical data.

The maximum cumulative storage increase (operating storage) and cumulative storage declines (groundwater reserves) described in **Table 6-2** do not represent the total groundwater storage that could potentially be used in the basin without incurring undesirable results; while not quantified, that volume is significantly greater.

6.3.6. Minimum Threshold

Undesirable results relative to groundwater storage have not occurred in North San Benito and numerical modeling of future conditions indicate that groundwater storage can continue to be operated within historical limits. Nonetheless, the potential for reduction of groundwater storage exists (probably involving disruption of surface water supply) and thus this section considers minimum thresholds for storage. According to GSP Regulations, the minimum threshold for storage is to be defined as the maximum groundwater volume that can be withdrawn without leading to undesirable results.

However, GSP Regulations allow the use of the groundwater level sustainability criteria (MTs and MOs) as a proxy for groundwater storage, provided that the GSP demonstrate a correlation between groundwater levels and storage. Groundwater levels and storage are closely related. This is demonstrated by comparison of groundwater level and storage trends, which reveal the same patterns

of historical overdraft, response to drought and recovery. The relationship of levels and storage is embodied in the calibrated numerical model.

The rationale for using groundwater levels as a proxy metric for groundwater storage is that the groundwater level MTs and MOs are sufficiently protective to ensure prevention of significant and unreasonable results relating to storage. In brief, groundwater level MTs have been defined to protect relatively shallow supply wells (see Section 6.2.6) and are based on the following:

- A broad geographic distribution of Key Wells that are representative of basin production wells.
- MTs that are based on 1977 groundwater levels, consistent with analyses of storage change.
- Analysis of existing wells with construction information and setting of MTs to avoid drying up these wells.
- MTs are relatively shallow; as shown in **Table 6-1**, all MTs are less than 200 feet deep while production wells in North San Benito are generally 150 to 500 feet deep.
- Groundwater level MTs include two consecutive exceedances in each of two years, providing early warning for storage changes, while also involving sixty percent or more of the Key Wells in Management Area, thus involving a broad area, consistent with storage change.

As a practical matter, the availability of groundwater storage will be constrained by water levels (including groundwater level proxies for depletion of interconnected surface water) and given all the above, the MTs for groundwater levels (see Table 6-1) are more than sufficiently protective of groundwater storage.

To summarize for the North San Benito Basin:

> The **Minimum Threshold** for storage for all Management Areas is fulfilled by the minimum threshold for groundwater levels. The **Minimum Threshold** for defining undesirable results relative to chronic lowering of groundwater levels is defined at each Key Well by historical groundwater low levels adjusted to provide reasonable protection to nearby existing wells. Undesirable results are indicated when two consecutive exceedances occur in each of two consecutive years, in sixty percent or more of the Key Wells in each Management Area.

The Sustainability Goal for the North San Benito Basin includes an objective to provide reliable storage for water supply resilience during droughts and shortages. Use of groundwater levels as a proxy also fulfills that objective. No additional MT definition is needed.

6.3.6.1. Relationship of Minimum Threshold to Other Sustainability Indicators

The MT for storage is related to other sustainability indicators as follows.

- **Water Levels.** The cumulative storage was estimated as the cumulative increase since 1975. This is consistent with the minimum thresholds for groundwater levels, also based on water levels from the mid-1970s (with local adjustments). The minimum thresholds for groundwater levels are protective of relatively shallow wells; therefore, these levels are protective of and serve as a proxy for groundwater storage and the provision of reliable storage for drought and shortage.
- **Seawater Intrusion.** There is no possibility of seawater intrusion in North San Benito basin. Accordingly, there is no minimum threshold and no relationship with other minimum thresholds.

- **Subsidence.** Subsidence is linked to groundwater levels. Because the storage reduction minimum threshold would not cause water levels to drop below their minimum thresholds, it would not interfere with the subsidence minimum threshold.
- **Water Quality.** Maintenance of groundwater storage within historical ranges would minimize any effects on water quality relative to water quality minimum thresholds. Groundwater quality issues in North San Benito Basin are associated primarily with salt and nutrient loading and not likely to be affected by groundwater storage within historical ranges.
- **Interconnected Surface Water.** The minimum thresholds for depletion of surface water flow are linked to historical groundwater levels near river reaches with shallow groundwater. Those water levels are generally equal to or higher than the minimum thresholds for water levels in those areas. Thus, it is more likely that the interconnected surface water threshold would constrain storage utilization rather than vice versa.

6.3.6.2. Effect of Minimum Threshold on Sustainability in Adjacent Areas

The North San Benito Basin is adjacent to the Llagas Subbasin in Santa Clara County. As stated in its 2016 Groundwater Management Plan, SCVWD (Valley Water) has previously estimated the operational storage capacity of the Llagas Subbasin to range between 152,000 and 165,000 AF. The operational storage capacity is less than total storage capacity because it accounts for the avoidance of adverse impacts. The estimate is based on the product of specific yield, area, and the elevation difference between high and low groundwater surfaces. Groundwater level data for 1982-1983 were used for the high levels and 1976-1977 for low levels (the same as used for North San Benito).

Groundwater flow directions are normally from southern Llagas Subbasin into the Bolsa MA (see Groundwater Conditions, **Figures 4-8** and **4-9**) with some drainage into the Pajaro River. The groundwater level MTs for North San Benito would support maintenance of groundwater levels and storage within the historical range in Bolsa and this in turn will support maintenance of operational groundwater storage in Llagas Subbasin. Similarly, outflow to the Pajaro River would be maintained within the historical range by the MT, which would not affect the ability of the Pajaro Valley GSA to achieve or maintain sustainability.

6.3.6.3. Effect of Minimum Threshold on Beneficial Uses and Users

Beneficial uses and users of groundwater storage include maintenance of interconnected surface water and associated GDEs and agricultural, municipal, industrial, and domestic groundwater users. The MTs for groundwater levels are based generally on historical lows, which recognizes that groundwater has been and is being used reasonably for the range of beneficial uses even during droughts. The storage minimum threshold is consistent with the water level minimum threshold, which means that available storage will be adequate to supply beneficial uses as long as water levels remain above their minimum thresholds.

6.3.6.4. Relationship of Minimum Threshold to Regulatory Standards

Other than SGMA, no federal, state, or local standards exist for reduction of groundwater storage.

6.3.6.5. How Management Areas Can Operate without Causing Undesirable Results

A storage change in one MA would be associated with a change in water levels. That change could affect groundwater flow between that MA and an adjoining one. The boundary flow would only change if storage and water levels in the adjoining MA did not experience a similar change. The only anticipated

change in land use or pumping patterns that might alter the relative storage fluctuations among the MAs during future droughts would be an increase in Southern MA pumping to supply new irrigated acreage. However, that increase is expected to be small relative to storage changes in the adjoining Hollister MA and not jeopardize groundwater availability in that MA. Therefore, no incompatibility among MAs with respect to storage declines is anticipated.

6.3.6.6. How the Minimum Threshold will be Monitored

Monitoring for the groundwater levels MT, which is the proxy for storage, will be part of the SBCWD Groundwater Level Monitoring Program. Data and analytical results, including assessment of change in storage, are presented in the Annual Groundwater Reports.

6.3.7. Measurable Objectives

Measurable Objectives would be defined as an operating range of groundwater storage, allowing changes in groundwater storage with varying hydrologic and surface water supply conditions and as with conjunctive management of surface water and groundwater. The groundwater level MTs provide a protective historical low level that corresponds to the minimum threshold for storage, which would ensure that groundwater storage is in a historical operating range. This is prudent and reasonable, especially given the realization that considerable additional storage underlies portions of the basin. The Five-Year GSP Update could include consideration of using more of this storage locally as part of ongoing conjunctive use while also protecting shallow wells.

> The **Measurable Objective** for storage is fulfilled by the MT for groundwater levels, which maintain groundwater levels within the historical operating range.

Groundwater conditions with respect to depletion of groundwater storage are already sustainable. Therefore, no interim milestones are needed to achieve sustainability by 2042.

6.3.7.1. Discussion of Monitoring and Management Measures to be Implemented

Management actions to prevent chronic reduction of groundwater storage and to provide groundwater reserves for drought will be the same actions for maintenance of groundwater levels. No other specific management actions for storage have been identified and no specific implementation is warranted.

6.4. Land Subsidence

Subsidence has not been a known issue in the North San Benito Basin and undesirable results have not been reported. Nonetheless, the potential has been recognized for subsidence that could occur as a result of groundwater pumping and groundwater level declines, typically in areas underlain by thick layers of fine-grained alluvial sediments.

As described in Section 4.3, available information on vertical land displacement (subsidence) includes Global Positioning System (GPS) data using satellites: interferometric synthetic aperture radar (InSAR) and University Navigation Satellite Timing and Ranging System Consortium (UNAVCO). InSAR data provide mapping of ground surface elevations across the basin, presented at regular (generally monthly) intervals. UNAVCO data represent GPS measurements at selected permanent ground stations, which provide long-term temporal measurements.

The InSAR data (as of May 2020) include two datasets, TRE Altamira InSAR Dataset and National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL) InSAR Dataset. The NASA JPL provides data from May 2015 to April 2017, while the TRE Altamira provides annual and total vertical displacement data beginning in June 2015 and in monthly intervals thereafter until September 2019. While these are short periods of record, both datasets indicate local areas of subsidence in portions of the Bolsa, Hollister, and San Juan MAs. Given the short records of these datasets, small vertical displacements (0 to -2 inches), and patchy distribution of areas, these data have not been analyzed systematically to identify specific areas that might be subject to long-term subsidence. As datasets are updated and refined by DWR, that will be planned for the future.

The UNAVCO data provide temporal measurements at established ground stations. Most of the UNAVCO stations are along the basin margins and/or at higher topographic elevations, better suited to track tectonic movements than groundwater-related subsidence. However, there is one UNAVCO ground surface elevation monitoring station located in a low lying alluvial portion of the basin (in Bolsa MA at Frazier Lake Air Park). As shown in **Figure 6-4**, GPS data from this monitoring station (P242) shows seasonal elastic variability (generally two inches or less) and a long-term declining trend that suggests local inelastic subsidence related to groundwater pumping. While data are limited, subsidence also is indicated by comparison of the pattern of land subsidence trends at P242 with groundwater level trends in nearby wells. This subsidence apparently is local (see **Figure 4-12**), and at the UNAVCO station, amounted to about two inches over the past 15 years.

Data are limited not only on groundwater-related subsidence, but also potentially associated pumping and groundwater levels. SGMA allows groundwater level data to be used as a proxy for subsidence; however, relationships between pumping, groundwater levels, and subsidence have not been determined to support that. Subsidence information from DWR (InSAR) and UNAVCO will be reviewed as it becomes available.

In brief, subsidence is a potential risk, and the Sustainability Goal includes an objective to prevent subsidence; this recognizes that inelastic subsidence is irreversible. However, it can be prevented by maintaining groundwater levels above historical lows. Insofar as data are available, subsidence prevention is supported by the minimum threshold for groundwater levels, which is equal to or above historical minimum levels.

6.4.1. Description of Undesirable Results

Land subsidence is the differential lowering of the ground surface, which can damage structures and hinder surface water drainage. Potential undesirable results associated with land subsidence due to groundwater withdrawals include the following:

- Potential differential subsidence affecting the gradient of surface drainage channels, locally reducing the capacity to convey floodwater and causing potential drainage problems and ponding.
- Potential differential subsidence damaging facilities or affecting the grade of infrastructure such as pipelines, airport runways, railroads, roads, and highways.
- Potential subsidence around a production well, disrupting wellhead facilities or resulting in casing failure.
- Potential non-recoverable loss of groundwater storage as fine-grained layers collapse.

None of these undesirable results has been observed in North San Benito Basin. However, subsidence may be subtle and cumulative over time. Accordingly, the potential for future subsidence cannot be ruled out if regional groundwater levels were to decline below historical lows and minimum thresholds.

6.4.2. Potential Causes of Undesirable Results

As described in Section 4.3, subsidence may be caused by regional tectonism or by declines in groundwater elevations due to pumping. Regarding the former, three UNAVCO sites bracket but are outside of the Southern MA (see **Figure 4-13**); these show relatively frequent but small changes (generally less than one inch in a year) and a generally rising trend that suggests regional tectonic rise. In contrast, inelastic subsidence associated with groundwater pumping and level declines would generally show a long-term downward trend, with greater subsidence occurring during times of groundwater level decline (e.g., drought) and a flattening trend with no recovery during times of rising groundwater levels and reduced pumping (e.g., wet years).

In brief, as groundwater levels decline in the subsurface, dewatering and compaction of predominantly fine-grained deposits (such as clay and silt) can cause the overlying ground surface to settle. Land subsidence due to groundwater withdrawals can be temporary (elastic) or permanent (inelastic). While elastic deformation is relatively minor, fully recoverable, and not an undesirable result, inelastic deformation involves a permanent compaction of clay layers that occurs when groundwater levels in a groundwater basin decline below historical lows. This causes not only subsidence of the ground surface, but also compaction of sediments and loss of storage capacity.

Given the above, the potential for problematic land subsidence is affected by the proportion, overall thickness, and configuration of fine-grained sediments (with greater proportions and thicknesses suggesting greater potential). Because of the variability of local sediments, subsidence also is likely to be geographically variable. Moreover, the potential for subsidence is affected by the history of groundwater level fluctuations, such that areas with previous groundwater level declines may have already experienced some compaction and subsidence.

The potential for subsidence, considering hydrogeologic factors, varies among Management Areas. Notably in Southern Area, subsidence potential is not likely significant, given the relatively high portion of coarse-grained materials (which are less susceptible to subsidence) along the San Benito River and Tres Pinos Creek. Available InSAR mapping shows minimal vertical displacements and data from nearby UNAVCO stations do not show downward displacement in Southern MA.

6.4.3. Potential Effects on Beneficial Uses and Users

The lack of any reports of undesirable results is an indication of no noticeable effects; San Benito landowners are informed and aware of subsidence problems in the Central Valley that cause the above bulleted effects. Nonetheless, some subsidence could have occurred because of historical groundwater level declines without being noticed. This could have contributed to drainage or flooding problems, which are the affected by multiple and sometimes more noticeable factors including variable weather, changes in streams and drainage systems, land use changes in the watershed, erosion, and sedimentation. Accordingly, continued tracking of subsidence and efforts to prevent subsidence are warranted.

6.4.4. Minimum Threshold

According to the GSP regulations Section 354.28(c)(5) the minimum threshold for land subsidence is defined as the rate and extent of subsidence that substantially interferes with surface land uses. This section first addresses the rate at which subsidence substantially interferes with surface land uses and then describes how available InSAR data can be used to measure rate and extent across the basin.

> The **Minimum Threshold** for **subsidence** is defined as a rate of decline equal to or greater than 0.2 feet in any five-year period. This has been considered in terms of a cumulative decline equal to or greater than one foot of decline since 2015; 2015 represents current conditions and the SGMA start date.

The 1-foot criterion is reasonable based on standards for flooding and drainage and on empirical data for well casing collapse:

- Ground floor elevations are recommended or required to be at least 1 foot above the Base Flood Elevation in some jurisdictions (see for example Federal Emergency Management Agency, 2003).
- The minimum freeboard along roadside ditches is often required to be 1 foot above the maximum anticipated water level (see for example County of Santa Clara, 2007).
- In the southwestern part of the Sacramento Valley, where documented cumulative subsidence has reached several feet, video surveys of 88 undamaged wells and 80 damaged wells showed that casing damage was uncommon in wells where subsidence was less than 1 foot (Borchers et al., 1998).

Subsidence impacts can be relatively rapid and noticeable. However, in North San Benito, any subsidence has been slow and not noticed and if occurring in the future, is likely to be gradually cumulative as would be its undesirable results. Accordingly, the 1-foot decline since 2015 is an appropriate criterion, with the understanding that it will be re-evaluated in the 2027 GSP Update.

This is generally equivalent to a rate of decline equal to or greater than 0.2 feet in any five-year period. The five-year period is selected as consistent with preparation of Five-Year Updates of the GSP and allows for data review and evaluation over several years. The amount of decline of 0.2 feet recognizes measurement and mapping error in the InSAR data (as of 2015 to 2018), which has been estimated at 0.1 foot (Brezing, 2020). Accordingly, the MT incorporates reasonable uncertainty. DWR has been adjusting InSAR mapping to focus on stable reflectors (such as roads and buildings) and thereby improve accuracy.

Based on available data and using the above criterion, significant and unreasonable subsidence has not occurred since 2015 in the North San Benito Basin. Moreover, it is unlikely that the criterion will be exceeded. UNAVCO monitoring of station P242 indicates cumulative inelastic subsidence of about two inches over the past 15 years.

The extent of cumulative subsidence across the basin will be monitored using the InSAR satellite-based data that DWR has been providing on the SGMA Data Portal website. The data consist of a closely-spaced grid of elevation points; as data are compiled at each point over time, temporal trends may become apparent. As described in more detail in Section 6.4.4.6, these data will be reviewed to identify

any occurrence and extent of subsidence. These values for cumulative elevation change will then be compared annually with the minimum threshold criterion.

6.4.4.1. Relationship of Minimum Threshold to Other Sustainability Indicators

Subsidence is closely linked to groundwater levels. It is unlikely that significant inelastic subsidence would occur if groundwater levels remain above their minimum thresholds. The water level minimum thresholds, generally based on historical lows or higher levels, do not interfere with managing the other sustainability indicators to remain above their respective MTs, as described in Section 6.2.

The subsidence MT would have little or no effect on other MTs. Specifically, subsidence MTs would not result in significant or unreasonable groundwater elevations, would not affect pumping and change in storage, would not affect groundwater quality, or result in undesirable effects on connected surface water.

6.4.4.2. Effect of Minimum Threshold on Sustainability in Adjacent Areas

The North San Benito Basin is adjacent to the Llagas Subbasin in Santa Clara County. Groundwater flow directions are from southern Llagas Subbasin into the Bolsa MA (see Groundwater Conditions, **Figures 4-8** and **4-9**) with some drainage into the Pajaro River. The subsidence MT has little or no effect on groundwater elevations, which would be managed relative to groundwater level MTs.

The North San Benito Basin is upstream of the Pajaro Valley Subbasin; the two are linked by flows in the Pajaro River. The MTs for the North San Benito Basin represent current conditions; establishment of MTs and maintenance of groundwater levels would not affect the ability of the Pajaro Valley GSA to achieve or maintain sustainability.

6.4.4.3. Effect of Minimum Threshold on Beneficial Uses and Users

Subsidence problems have not been reported in North San Benito Basin, but subsidence remains a potential undesirable result that may contribute incrementally to reduced drainage, increased flooding, or other undesirable results. The effects of establishing the numerical subsidence MT are beneficial because they support a greater chance of detecting subsidence, supporting management actions to maintain groundwater levels, and preventing significant subsidence.

6.4.4.4. Relationship of Minimum Threshold to Regulatory Standards

There are no federal, state, or local standards specifically addressing subsidence. There are standards for flood depth, floodplain encroachment, freeboard in ditches, and canals and slopes of gravity-flow plumbing pipes. These vary somewhat from jurisdiction to jurisdiction, but they are generally similar and were used as the basis for selecting the MT (see details in Section 6.4.4).

6.4.4.5. How Management Areas Can Operate without Causing Undesirable Results

The MTs are consistently conceived and applied across all four Management Areas. The possibility remains that potential subsidence in the Southern MA is not significant; tracking and analysis of InSAR mapping over the next five years (until five-year update) may be revealing about that. Meanwhile, maintenance of groundwater levels at or above historical lows will tend to maintain current conditions between the successive MAs from upstream to downstream.

6.4.4.6. How the Minimum Threshold will be Monitored

The minimum threshold will be monitored using the UNAVCO site-specific and InSAR areal data. Cumulative subsidence will be monitored using the InSAR satellite-based geodetic data that DWR has

been providing on the SGMA Data Portal website. The data are "raster" data sets consisting of a grid of elevation points spaced approximately 300 feet apart. The data sets have had considerable "noise," meaning that adjacent points may very different readings at the scale of 1-2 inches. Some of this apparently random variation might have been due to agricultural activities, and some might be due to inherent measurement error associated with atmospheric conditions; DWR has been addressing these issues in its recent mapping. The InSAR data will be evaluated to identify any occurrence and areal extent of subsidence. As data are provided over the next few years, this evaluation will involve review of temporal InSAR data to discern seasonal elastic fluctuations and potential inelastic declines; the UNAVCO data provided at Station P242 would be a useful guide. In addition, any areal extent will be examined; this may involve smoothing of elevation changes over the InSAR grid to summarize the results to a spatial scale at which subsidence would plausibly occur. The cell values for cumulative elevation change will then be compared with the minimum threshold criterion.

6.4.5. Measurable Objectives

The Sustainability Goal includes the objective to prevent subsidence. Accordingly, the Measurable Objective is conceptually zero subsidence while acknowledging measurement error and other uncertainties. Undesirable subsidence results have not occurred, and accordingly, no interim milestones are defined.

6.4.5.1. Representative Monitoring

It is assumed that the UNAVCO and InSAR subsidence monitoring programs will continue for the foreseeable future and InSAR data will be available from the DWR website. The GSP monitoring program for subsidence will involve annual download of UNAVCO and InSAR data with analysis for signs of cumulative inelastic subsidence.

6.4.5.2. Discussion of Management Actions to be Implemented

Management actions to prevent subsidence will be coordinated with actions relative to maintenance of groundwater levels. These actions involve maintaining groundwater levels above historical low water levels and will prevent significant inelastic subsidence. No other specific management actions for subsidence have been identified and no specific implementation is warranted.

6.5. Seawater Intrusion

Seawater intrusion does not occur in the North San Benito Basin because of its inland location. According to the GSP Regulations, the GSP is not required to establish criteria for such undesirable results that are not likely to occur. Accordingly, the remaining discussion in this section does not address seawater intrusion.

6.6. Degradation of Water Quality

Degraded water quality can impair water supply and affect human health and the environment. Impacts to drinking water supply wells can result in increased sampling and monitoring, increased treatment costs, use of bottled water, and the loss of wells. As described in Groundwater Conditions Sections 4.7 and 4.8, elevated concentrations in drinking water of some constituents, such as nitrate, can adversely affect human health. Impacts to agricultural supply can include reduced yields, the need to change

irrigation methods/sources, and other economic effects. Discharge of degraded groundwater can harm ponds, wetlands, and associated ecosystems (e.g., eutrophication).

Consideration of the causes and circumstances of water quality conditions is important in North San Benito because general mineral quality (e.g., TDS, iron and manganese, boron, etc.) is naturally poor throughout much of the basin, has been poor for decades, and nonetheless has been used for beneficial purposes including irrigation, municipal, and domestic purposes. Sustainable management is about use and management of groundwater without causing undesirable results but does not necessarily include reversing natural undesirable conditions. According to SGMA (§10727.2(b)(4)), a GSP may—but is not required to—address undesirable results that occurred before and have not been corrected by the SGMA benchmark date of January 1, 2015.

While native groundwater quality is poor, salt and nitrate loading also are recognized as sources of groundwater quality deterioration. Such loading has been occurring for more than 100 years; however, changes in groundwater quality at depth (where groundwater typically is pumped) will lag behind the salt and nutrient loading at the ground surface by decades to centuries (Fogg et al., 1999). This means that groundwater quality monitoring data can be misleading, sustainability criteria based on such data potentially could be reactive to decades-old land use conditions and insensitive to the future, and the effects of management activities may not be seen for decades. Nonetheless, data needs are recognized in the GSP, and monitoring program improvements will be identified and implemented.

Given all that, the sustainability goal—to protect groundwater quality—is not to reverse undesirable water quality conditions by 2042 but rather to prevent circumstances wherein future management activities might make water quality worse and insofar as possible to improve water quality in the long run. Implementation of management actions is recognized as needed now and, whether or not the results are perceptible in the short term, such actions will be helpful in the long term.

6.6.1. Potential Causes of Undesirable Results

The quality of groundwater in North San Benito Basin is characterized as highly mineralized, reflecting natural hydrogeologic processes (see Groundwater Conditions Section 4.4). Groundwater also has been affected by human activities including agricultural, rural, urban, and industrial land uses. While contaminant sources of groundwater quality degradation exist, these are effectively regulated as described in Groundwater Conditions Section 4.6 and regularly tracked as part of the SBCWD monitoring program.

As described in the Groundwater Conditions Section 4.7, TDS and nitrate are constituents of concern for the Basin. While there are elevated natural background TDS concentrations in groundwater, TDS also is an indicator of human impacts including infiltration of urban runoff, agricultural return flows, and wastewater disposal. Natural nitrate levels in groundwater are generally very low, and elevated concentrations are associated with agricultural activities, septic systems, confined animal facilities, landscape fertilization, and wastewater treatment facility discharges.

Other potential constituents of concern in North San Benito include perchlorate, selenium, hardness, boron, iron, manganese, arsenic, and chromium. As described in Groundwater Conditions Section 4.8, these represent diverse issues relative to representing potential causes of undesirable results.

- Perchlorate and selenium in the North San Benito Basin are associated with regulated facilities. As part of its regular monitoring program, SBCWD compiles and reviews data from regulated sites on a triennial basis. Regulated sites are listed and identified on a map (see Figure 4-17), and concentration data are reviewed with reference to MCLs. This recognition of regulated facilities and regular review is effective in minimizing potential undesirable results that could occur because of project or management actions that would spread contamination. The GSAs have established, collaborative relationships with regulatory agencies.
- Hardness is a naturally occurring and widespread condition that represents a concern mostly because it prompts residential use of water softeners that cause salt loading to wastewater. While hardness is regularly tracked, the salt loading issue is being addressed by various water resource management programs including the Hollister Urban Area Water Project and the SNMP (see Section 2.1.4.3).
- Boron, iron, manganese, arsenic, and chromium are naturally occurring in North San Benito Basin. Elevated concentrations have been mapped (for example, boron and manganese) and/or found to be associated with depth. In North San Benito, groundwater management activities generally have resulted in stabilized, relatively high groundwater levels since the late 1970s without the major changes in groundwater levels or flow directions that would potentially mobilize these constituents. While a potential could arise because of intensification of groundwater pumping or management actions, no significant or unreasonable effects are known to have occurred and are considered unlikely.

Sustainable criteria have not been developed in this GSP for these constituents because they are already managed under existing programs or because they are naturally occurring and unlikely to be affected by GSP management actions. Nonetheless, monitoring of these constituents will be continued, project and management actions will be planned in light of potential effects, and sustainable criteria can be developed as needed for a constituent during a regular five-year review.

6.6.2. Description of Undesirable Results

The processes and criteria relied on to define Undesirable Results included review of available data and information summarized in the Plan Area and Groundwater Conditions sections and discussions with North San Benito stakeholders and local agency representatives.

Undesirable Results are defined in the GSP Regulations (§354.26) as occurring when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin. The GSA is not responsible for local problems or degradation caused by others. While the North San Benito Basin includes regulated facilities with soil and groundwater contamination (see Groundwater Conditions Sections 4.4 and 4.6.1), these sites are under regulatory oversight by State agencies; the GSA does not have the mandate or authority to duplicate these programs. Nonetheless, SBCWD historically has cooperated with these agencies and checks regulator files regularly as part of its water quality monitoring program. In addition, this GSP avoids management actions that would spread groundwater contamination through managed aquifer recharge, pumping, or other activities.

In fact, SBCWD historically has conducted management actions and programs (often in cooperation with other agencies) to improve groundwater quality. As documented in Plan Area Section 2.1.4.3, these activities have included percolation of high-quality surface water, treatment of imported surface water

for municipal use (which improves wastewater quality), wastewater treatment plant improvement and water recycling, and programs to reduce urban and agricultural salt and nutrient loading.

6.6.3. Potential Effects on Beneficial Uses and Users

Groundwater is the major source of supply in the GSP Area and supports a range of beneficial uses: agricultural, municipal, rural, and environmental. Reflecting the agricultural orientation of the GSP area, all land and property owners, residents, businesses, employees, farmers, and visitors are potentially affected by groundwater quality with respect to its specific use. Beneficial uses of water and respective water quality objectives are defined by the Central Coast Regional Water Quality Control Board (RWQCB) in the Basin Plan. For TDS and nitrate, these are tabulated in the GSP Groundwater Conditions (Section 4.7 Key Constituents of Concern); this section indicates that water quality in the Basin is naturally mineralized and affected by human activities and has not been shown to change significantly. While the limitations of monitoring are known, it is also recognized that groundwater has been and is being used for the range of beneficial uses with reasonable accommodation by users. This recognition does not preclude or ignore a desire by the community or intent of local agencies including the GSAs to improve local groundwater quality.

6.6.4. Sustainable Management Criteria for Groundwater Quality

The definition of an Undesirable Result due to degraded water quality—TDS and nitrate concentrations—was evaluated in the context of historical, existing, and potential future conditions in each MA. A major consideration in this evaluation is the reality of historical salt and nitrate loading to shallow portions of the principal aquifers. In deep alluvial basins such as North San Benito, there is typically a delay of decades for solute loading at the land surface to noticeably affect groundwater quality at the depths tapped by water supply wells. The amount of such legacy loading is not known nor is the rate at which it is moving down. (Substantial scientific investigation and years of monitoring would be needed to get reliable estimates.) Accordingly, water quality sampling included in the Groundwater Conditions section and/or most recent SBCWD Triennial Groundwater Quality Update (Todd, 2019) does not likely reflect the current, improved land use practices and water management activities. In the long run, implementation of such best management practices will reduce loading relative to what would have happened otherwise.

Moreover, monitoring of water quality in water supply wells over the next 20 years is not an appropriate means of tracking or verifying sustainability because water quality will primarily reflect loading that occurred prior to 2015 and likely get worse over that period regardless of active measures to reduce salt and nitrate loading. In light of this lag and the difficulties in quantifying it, the GSAs will conduct scientific investigations and improve monitoring (Section 6.6.6.2 identifies such measures).

For the decision to set sustainable management criteria, SGMA poses two basic questions: were undesirable results occurring as of the SGMA baseline of January 2015? And is there a potential for future undesirable results? The first question is currently un-answerable with any certainty because the groundwater system has not yet fully responded to recent changes in wastewater quality and agricultural loading. However, a potential for undesirable results during the next 20 years is undeniable as legacy loading arrives at deeper aquifers. Accordingly, consistent with SGMA, criteria must be set for groundwater quality.

GSP regulations require that the minimum threshold for degraded water quality be based on "the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the agency to be of concern for the basin" (§354.28(4)). The number of supply wells are considered here for the minimum threshold. This is because the issues of concern in North San Benito are focused on regional nitrate and salt loading, data are insufficient to define plumes or volumes of water, and the position of an isocontour is not applicable.

Notwithstanding the problem of legacy loading and the inherent limitations of water quality monitoring, best available data on groundwater quality were examined to develop MTs for TDS and nitrate in each MA. Two data sets are identified from the monitoring programs described below. As indicated below, both monitoring programs present limitations for setting MTs now, but also provide a foundation for adaptive management that is protective of groundwater quality while defining additional management actions (e.g., scientific study of vertical distribution of constituents) and monitoring program improvements (e.g., improved well network).

6.6.4.1. SBCWD Water Quality Monitoring Program

SBCWD established the water quality monitoring program for the protection of beneficial uses, understanding of human and natural factors that affect water quality, and support for groundwater management decisions (Todd, 2004). SBCWD has regularly monitored groundwater and surface water sites. Some of the wells are included to track and respond to local problems and the remainder are included to represent regional conditions. The network of wells historically has been focused on the Hollister and San Juan areas with only about 20 wells (see Groundwater Conditions **Figure 4-15**) but is in the process of being expanded to encompass the entire basin (Todd, 2019). The wells generally are sampled quarterly to a minimum of annually with lab analysis for general minerals, physical parameters, and selected constituents of concern. Accordingly, this data set can be used to detect a range of problems quickly, to track trends, allow geochemical investigation, and support focused management actions. In addition, the network includes the nested well in Hollister MA, a dedicated monitoring well that samples from five depth zones thus providing information on vertical distribution of constituents in this area.

6.6.4.2. Triennial Update Data

Once every three years, SBCWD compiles, reviews, and summarizes all available information on water quality in the basin. The most recent Triennial Update is provided in the 2019 Annual Groundwater Report (Todd, 2019) incorporated here by reference and in **Appendix E**. The triennial update incorporates all available data from SBCWD, other local agencies, and State agencies. The data include information from the RWQCB Irrigated Lands Regulatory Program that collects and synthesizes data (focused on nitrate but including TDS) from numerous agricultural growers in the Central Coast Groundwater Coalition. Accordingly, the Triennial Update provides a relatively large set of nitrate and TDS data from numerous wells widely distributed across the basin.

Table 6-3 summarizes the number of wells sampled for nitrate and TDS during Current Conditions as defined in this GSP. As shown, the number of sampled wells is relatively large even on a Management Area basis and can support statistical analysis. Limitations of this data set include the uneven and potentially shifting distribution of sampled wells across the basin, lack of information on the vertical zone being sampled (well construction information), relatively less frequent sampling schedule and absence of historical record, variable data availability on specific constituents and parameters, and multiple sources of information from programs with differing objectives and procedures. These

limitations present significant uncertainties to the GSA and stakeholders who are required to establish quantitative, measurable criteria and then comply with them, with real-world consequences.

Nonetheless, the Triennial Update data set provides a snapshot and overview of TDS and nitrate, which supplements the SBCWD monitoring program and can be used to identify useful wells to improve the SBCWD program.

Table 6-3. Triennial Update Data Set, Number of Wells with Nitrate or TDS Data, 2015-2017

Constituent	Number of Wells with Data, 2015-2017				
	Bolsa MA	San Juan MA	Hollister MA	Southern MA	Total
Nitrate (as NO_3)	35	81	121	19	256
Total Dissolved Solids	31	63	108	11	213

6.6.5. Minimum Thresholds

Minimum Thresholds are presented for nitrate and TDS for each of the MAs using the best available information, namely the Triennial Update data set which includes all known relevant data, including the data generated by the SBCWD Water Quality Monitoring Program. As summarized above, the limitations of this data set are recognized, and additional investigations and monitoring program improvements will be presented in this GSP for planned implementation. With adaptive management in mind, MTs may be revised to rely more on the SBCWD program in the future with regular reference to Triennial Updates as needed.

The MTs for nitrate and TDS quantify current conditions (2015 through 2017) based on available monitoring data. However, recognizing the problem of legacy loading and the inherent limitations of water quality monitoring, the approach of the GSP is to proceed with measures to reduce loading of nitrate and salts. While actions taken today may not yield measurable benefits by 2042, in the more distant future they will lower concentrations of nitrate and TDS below what they otherwise would have been without GSA actions. This strategy can be viewed as a “best management practices” approach as opposed to a “monitor and respond” approach.

Water quality monitoring nevertheless serves two useful purposes. First, it will eventually confirm whether concentrations begin leveling off as intended. Second, it can detect local sources of degradation that impact groundwater quality more strongly and rapidly than the slow, dispersed loading from agricultural activities. Early detection of local impacts can enable appropriate actions to halt further contamination before the impacts become severe or widespread.

6.6.5.1. Minimum Threshold for Nitrate (NO_3)

Table 6-4 summarizes current conditions for nitrate in reference to the MCL for nitrate in drinking water, 45 mg/L, which also is the Basin Plan Objective for municipal use. Current conditions for each MA are expressed in terms of the percent of wells with concentrations over 45 mg/L. To compute the

percent of wells, nitrate sampling results were compiled for each well over the period 2015 through 2017. For wells with one sample, the single value was used; for wells with two samples, the average value was used; and for wells with three or more values, the median value was used. Accordingly, each well was represented by one value. This was followed by computation of the percentage of wells with concentrations exceeding 45 mg/L.

This process of summarizing current conditions makes use of all available data. However, it is important to note that this data set does not represent a monitoring program designed by SBCWD. It also is recognized that the data are not representative of water supply conditions throughout the basin because the geographic distribution of wells is uneven and information from shallow and deep wells are combined. Monitoring program improvements will be implemented as part of the GSP to improve the data set (see Section 6.6.6.2) and provide a more reasonable basis for sustainability criteria.

Table 6-4. Summary of Current Conditions for Nitrate (NO_3)

MCL and Basin Plan Objective	Minimum Threshold - Percent Wells with Concentration over 45 mg/L, Current Conditions, 2015-2017			
	Bolsa MA	San Juan MA	Hollister MA	Southern MA
45 mg/L	11%	26%	14%	5%

As documented in **Table 6-4**, each MA includes wells yielding water with nitrate concentrations exceeding the MCL. Of the four MAs, the Southern and Bolsa MAs have the fewest wells exceeding the MCL and San Juan MA has the highest percentage, reflecting historical wastewater discharge and likely legacy nitrate loading from fertilizer use. While recognizing the number of wells affected by high nitrate concentrations, there has been historical and ongoing groundwater use with reasonable accommodation by users and accordingly, these conditions are considered sustainable.

Despite the significant uncertainties, the following MT is presented as a starting point for maintenance and planned improvement of groundwater quality for the 2042 deadline for sustainability.

> The **Minimum Threshold** for nitrate for each MA is defined initially as the percentage of wells with concentrations exceeding the nitrate MCL (45 mg/L) based on current conditions (2015-2017).

This MT is presented with full recognition of data needs and uncertainties, and with commitment incorporated in this GSP to investigate nitrate and salt loading under current conditions (including vertical distribution in shallow zones) and to implement management actions for reduction of nitrate and salt loading without delay.

Given the above definition, the MTs for nitrate in each MA are expressed in **Table 6-4**. These MTs refer to the numeric MCL and Basin Plan objective, honor the non-degradation policy, and quantify current conditions based on available data. As described in the following section, Measurable Objectives, the approach is to implement management actions that will maintain or reduce nitrate concentrations in the future. If the MT is exceeded (i.e. the percent of wells with concentrations above the MCL

increases), additional study is necessary to determine if the increase is the result of management actions (including groundwater pumping, recharge, etc.), legacy loading, or a changing data set.

6.6.5.2. Minimum Threshold for Total Dissolved Solids

Table 6-5 summarizes current conditions for TDS with reference to the 1,200 mg/L Basin-Specific Basin Plan Objective for the previously defined Hollister Area[9]. This value is far from ideal (e.g., with reference to the recommended 500 mg/L for drinking water and 450 mg/L for agriculture, see **Table 4-1**), but reflects the widespread conditions of elevated TDS concentrations in groundwater.

As with nitrate, computation of the percent of wells in **Table 6-5** involved compilation of sampling results for each well over 2015 through 2017. For wells with one sample, the single value was used; for wells with two samples, the average was used; and for wells with multiple values, the median was used, such that each well was represented by one value. This was followed by computation of the percent of wells with TDS concentrations exceeding 1,200 mg/L.

This process makes use of all available data. However, this data set does not represent a monitoring program designed by SBCWD. In addition, the data are not representative of water supply conditions throughout the basin because the depths and geographic distribution of wells is uneven. Monitoring program improvements will be implemented as part of the GSP to improve the data set and provide a more reasonable basis for sustainability criteria.

Table 6-5. Summary of Current Conditions for Total Dissolved Solids (TDS)

General Basin Plan Objective	Minimum Threshold - Percent Wells with Concentration over 1,200 mg/L, Current Conditions, 2015-2017			
	Bolsa MA	San Juan MA	Hollister MA	Southern MA
1,200 mg/L	26%	45%	24%	27%

As documented in **Table 6-5**, each MA includes wells yielding water with TDS concentrations exceeding 1,200 mg/L. Of the four MAs, the Hollister and Bolsa MAs have the fewest wells exceeding the MCL. Southern MA has a relatively high percentage, despite its location upstream of the remainder of the basin and its limited areas of intensive land use (it is mostly rangeland); this likely reflects the uneven distribution of the few monitoring sites (only 11 per **Table 6-3**) and possibility of local degradation, and the natural, mineralized quality of local groundwater. San Juan MA has the highest percentage, representing the cumulative effects of mineralized natural quality, historical wastewater discharge, and legacy salt loading from evaporative concentration. While recognizing the number of wells affected by high TDS concentrations, there has been historical and ongoing groundwater use with reasonable accommodation by users and therefore, these conditions are considered sustainable.

[9] Basin-specific Basin Plan Objectives also include a 1,000 mg/L value for the previously-defined Tres Pinos Valley Basin, which was considered here as a criterion. However, this value pertains to only five square miles of the North San Benito Basin and was deemed not representative.

Despite the uncertainties, the following MT is presented as a starting point for maintenance and planned improvement of groundwater quality for the 2042 deadline for sustainability.

> The **Minimum Threshold for TDS** for each MA is defined initially as the percentage of wells with concentrations exceeding the TDS value of 1,200 mg/L based on current conditions (2015-2017).

As with nitrate, this MT is presented with full recognition of data needs and uncertainties, and with the commitment incorporated in this GSP to investigate nitrate and salt loading under current conditions and to expedite management actions for reduction of nitrate and salt loading.

Accordingly, the TDS MTs for each MA are expressed in **Table 6-5**. These MTs refer to the numeric Basin Plan objective, honor the non-degradation policy, and quantify current conditions based on available data. Given historical and ongoing groundwater use, these conditions are considered sustainable. As described in the following section, Measurable Objectives, the approach is to implement management actions that will maintain or reduce nitrate concentrations in the future.

As with Nitrate, if the MT is exceeded (i.e. the percent of wells with concentrations above 1,200 mg/L increases), additional study is necessary to determine if the increase is the result of management actions (including groundwater pumping, recharge, etc.), legacy loading, or a changing data set.

6.6.5.3. Relationship of Minimum Threshold to Other Sustainability Indicators

Three of the other sustainability indicators (groundwater level declines, storage depletion, subsidence) are directly linked to groundwater levels, while the sustainability indicator for connected surface water-groundwater dependent ecosystems is related to a rate or volume of surface water depletion, also linked to groundwater levels. The MTs for water quality are not known to be directly related to specific groundwater levels or fluctuations in groundwater levels. Nonetheless, general relationships are recognized, for example that contaminants may be mobilized by changing groundwater levels or flow patterns. Accordingly, the water quality MTs will help guide potential projects that alter groundwater levels or flow.

6.6.5.4. Effect of Minimum Threshold on Sustainability in Adjacent Areas

The North San Benito Basin is adjacent to the Llagas Subbasin in Santa Clara County. Groundwater flow directions are normally from southern Llagas Subbasin into the Bolsa MA (see Groundwater Conditions, **Figures 4-8** and **4-9**) with some drainage into the Pajaro River. Given the likelihood of continued relatively low elevations in Bolsa, groundwater flow is likely to remain unchanged and groundwater quality in North San Benito is unlikely to affect Llagas.

The North San Benito Basin is upstream of the Pajaro Valley Subbasin; the two are linked by flows in the Pajaro River. The MTs for the North San Benito Basin represent current conditions; establishment of MTs and maintenance of such conditions (which reflect native quality and legacy loading) would not affect the ability of the Pajaro Valley GSA to achieve or maintain sustainability.

As consideration beyond the requirements of this section, some management actions to improve groundwater quality in North San Benito (for example enhancing outflow of poor-quality groundwater) could potentially have adverse impacts downstream. However, potential impacts of management actions and projects will be addressed through CEQA. Overall improvement of North San Benito groundwater quality through other management actions (e.g., increased CVP percolation with maintenance of outflow) would be beneficial.

6.6.5.5. Effect of Minimum Threshold on Beneficial Uses and Users

The establishment of the MTs reflects the current condition of the MAs relative to nitrate and TDS concentrations, insofar as available data and monitoring allow us to know. Establishing the MTs represents no change and recognizes that groundwater has been and is being used reasonably for the range of beneficial uses. The MTs represent a quantified starting point for protection of groundwater quality and for projects and management actions to improve groundwater quality, consistent with a best management practices approach.

6.6.5.6. Relationship of Minimum Threshold to Regulatory Standards

The MTs have been established with direct reference to regulatory standards, most notably the Basin Plan Objectives set by the RWQCB, while recognizing that current nitrate and TDS concentrations in many wells do not meet regulatory standards. Because of legacy loading, improvements relative to regulatory standards may be difficult to demonstrate.

6.6.5.7. How Management Areas Can Operate without Causing Undesirable Results

The establishment of MTs has been consistently conceived and applied across all four Management Areas. For all MAs, the goal is to protect groundwater quality and all MTs are based on available information on current conditions. It is not known if the current status represents equilibrium conditions between the successive MAs from upstream to downstream and change may occur between them. The MAs were established to aid in implementation and operation of management actions and projects, which will include actions to improve groundwater quality in all MAs.

6.6.5.8. How the Minimum Threshold will be Monitored

The GSP is using the best available information, namely data from the SBCWD Water Quality Monitoring Program and Triennial Update. The SBCWD Monitoring Program will be improved and expanded to include a broader and even distribution of sampled wells across the basin and more information on the vertical distribution of constituents, along with its regular sampling schedule, historical records, and data on specific constituents and parameters. Through adaptive management, this SBCWD program may become the primary basis for MT tracking with reference to Triennial Updates.

6.6.6. Measurable Objectives

The sustainability goal is to protect groundwater quality, with general objectives of maintaining groundwater quality, preventing circumstances where future management activities might make water quality worse, and improving groundwater quality in the long run. In setting Measurable Objectives, a key issue is legacy loading, where the amount of historical loading is not known nor is the rate at which it is moving down to affect deep pumping zones. Because of the uncertainties associated with legacy loading, the use of water quality monitoring to track or verify sustainability needs to be tempered with a broad margin of operational flexibility. This margin should acknowledge the possibility (and even likelihood) that monitoring could indicate undesirable results—those stemming from past practices—while present reductions in loading are not yet perceptible.

6.6.6.1. Description of Measurable Objectives

Measurable Objectives are defined in this GSP using the same metrics and monitoring data as used to define Minimum Thresholds and are established to maintain or improve groundwater quality. Given the significant uncertainties presented by legacy loading and by data limitations, a reasonable margin of safety includes the possibility of “negative” monitoring results while positive progress is being made.

The **Measurable Objective for nitrate** is defined as maintaining or reducing the percentage of wells with median concentrations exceeding the nitrate MCL (45 mg/L) based on conditions documented in the Triennial Updates.

The **Measurable Objective for TDS** is defined as maintaining or reducing the percentage of wells with median concentrations exceeding the TDS value of 1,200 mg/L based on conditions documented in the Triennial Updates.

Measurable Objectives will be evaluated in increments of five years and the numeric values will be presented with comparison to the Current Conditions. This comparison will be discussed in the context of actual progress in implementing measures to improve monitoring and management.

6.6.6.2. Discussion of Monitoring and Management Measures to be Implemented

The strategy of this GSP is to identify and implement monitoring and management measures to reduce nitrate and salt loading. Monitoring and management actions already undertaken are summarized in Plan Area Section 2.1.4. and would be continued, most notably including the following:

- Hollister Urban Area Water Project water treatment plants that allow expanded use of CVP water and thereby improve wastewater quality.
- Hollister Urban Area Water Project for wastewater treatment improvements (nitrate reduction) and water recycling.
- Hollister Urban Area Water and Wastewater Master Plan and San Benito Water Resources Association program to reduce salt loading from water softener use.
- RWQCB Irrigated Lands Regulatory Program, which requires nitrate budgeting for most irrigated fields in San Benito County.

Additional **monitoring measures** include the following:

- Additional investigations and monitoring of nitrate and salt loading, most notably monitoring and analysis of the vertical distribution and migration of these constituents in the subsurface, with a focus on shallow groundwater conditions that reflect recent and current loading.
- Improvements to the SBCWD monitoring network including additional monitoring wells (including dedicated wells and shallow wells), improved distribution of sites and better representation of basin conditions geographically and vertically.
- Development of a systematic response program as part of the SBCWD Monitoring Program to address localized water quality problems (including significant short-term constituent increases and rising trends) with analysis to identify cause(s), outreach and education, and cooperation with the appropriate regulatory agency.

Additional **management measures** include the following:

- Increased percolation of good quality CVP water and local surface water, including additional managed aquifer recharge projects.
- Development of a stormwater recharge program including cooperation with local agencies to prepare a Storm Water Resource Plan, with identification of opportunities to increase recharge using local storm runoff.
- Analysis of basin outflows relative to salt management.

- Collaboration with UC Extension toward reduced nitrate and salt loading by agriculture.
- Enhanced cooperation with the County and local agencies on regulation of water softeners and wastewater treatment/disposal including onsite wastewater treatment systems (OWTS or septic systems).
- Enhanced outreach to North San Benito County stakeholders (including disadvantaged communities) on groundwater quality issues.

6.6.6.3. Description of Reasonable Pathway

Implementation of this GSP will include regular updates on a five-year basis. This will include evaluation of Measurable Objectives with comparison to Current Conditions (2015-2017) and to conditions documented in successive Triennial Updates. Because groundwater quality conditions are considered sustainable, interim milestones toward sustainability are not relevant. These comparisons will be discussed in the context of actual progress in implementing measures to improve monitoring and management.

A first step along the pathway will be analysis of the triennial data set used to establish criteria. A subset of the wells will be selected considering factors such as: uniform geographic representation, availability of well depth information, and continuity from one triennial period to the next. This first step will be completed during the first five years of GSP implementation.

The Management Actions and Implementation Plan sections of this GSP are intended to provide additional detail on the scope, scheduling, and estimated costs of the measures to be implemented.

6.7. Depletions of Interconnected Surface Water

This section builds and extends the discussion in Section 4.11, Interconnection of Surface Water and Groundwater. That section provided information on surface water-groundwater connections (both seasonally and with wet years and drought), identification of potential GDEs (e.g., with The Natural Communities Commonly Associated with Groundwater (NCCAG) dataset), distribution of riparian vegetation, and identification of animal species that rely on groundwater-supported streamflow, most notably steelhead trout (see Figures 4-22 and 4-24)

6.7.1. Description of Undesirable Results

If a stream is hydraulically connected to groundwater, pumping from nearby wells can reduce the amount of stream flow by intercepting groundwater that would have discharged into the stream or by inducing seepage from the stream. Undesirable results associated with stream flow depletion include reduced quality and quantity of aquatic and riparian habitats and reduced water supply to downstream users. Conceptually, adverse habitat impacts can result from decreased rainfall, decreased stream flow and lowered groundwater levels. These variables are highly correlated in time: droughts include rainfall reductions, decreased stream flows, and lowered groundwater levels at a time when habitat impacts are usually the most severe. Furthermore, droughts and wet periods are a natural feature of California's climate and are associated with waxing and waning of habitat conditions.

6.7.2. Potential Causes of Undesirable Results

This section presents extensive analysis of the key variables as they relate to riparian vegetation and steelhead trout migration along major waterways in the North San Benito Basin. It draws on basic data

and on a simulated change in regional groundwater pumping using the basin-wide groundwater flow model introduced in Section 5 Water Budget. The specific objective was to isolate and quantify the effects of groundwater pumping and levels on GDEs, namely riparian vegetation extent and vigor and on passage opportunity for migrating fish.

6.7.2.1. Pumping

While recognizing that undesirable depletion of surface water is likely the result of multiple factors, a key question remains regarding the specific effect of pumping. The numerical model was applied to address this question. The effects of pumping on interconnected surface water were simulated as a global 10 percent reduction in groundwater pumping in the future baseline simulation. The 86-year future baseline simulation represents hydrologic conditions corresponding to water years 1922-2007 with existing land use, water use, and estimated CVP water availability. Theoretically small increases and decreases in pumping from existing amounts would have roughly equal but opposite effects on water levels and stream flow. A 10 percent increase in pumping could have been simulated instead of a decrease. The simulation would continue to run, but there would be no results for the dry cells and slightly distorted results for active cells near the dry area. The results with decreased pumping are compared with the future baseline simulation to evaluate the effects of changes in pumping. The reduction was applied uniformly to all types of pumping and in all time steps. This is not a proposed management action and is not entirely realistic. It simply illustrates the marginal effect of a change in pumping from current conditions. The 10 percent reduction in pumping amounted to 9,150 AFY, which is equivalent to a continuous flow of 12.6 cfs. No corresponding changes were made to return flows from irrigation and wastewater.

6.7.2.2. Rainfall

Hydrologic and vegetation conditions at the beginning and end of a major wet period were compared to identify the effects of hydrologic variables on vegetation. A cumulative departure graph of annual precipitation in Hollister (see **Figure 5-4**) showed that October 1992 was at the end of a major drought and the start of a major wet period that ended in April 1998. Vegetation conditions and groundwater levels were compared between those two dates to identify correlations between the variables.

6.7.2.3. Groundwater Levels

A central question in the relationship between groundwater levels and riparian vegetation is the rooting depth of phreatophytic plant species, which are ones that extend roots to the water table and extract groundwater during the dry season when soil moisture is depleted. A survey of riparian ecology literature (mostly studies in more arid regions of the southwestern United States) indicated that rooting depths for common California riparian phreatophytes such as cottonwood, mulefat, sycamore, and various willow species are mostly in the range of 2-13 feet (The Nature Conservancy, 2019a). Other trees such as box elder and valley oak are commonly associated with streams but at higher elevations with depths to water of up to 30 feet (Griggs, 2009). However, those species do not necessarily use the water table. The presence of dense, lush riparian trees along some stream reaches in San Benito County is an indication that the vegetation is accessing the water table. For this analysis, a water table depth of 20 feet is used as an estimate of the maximum depth accessed by riparian vegetation[10].

[10] A 15-foot depth to water is used in the model to simulate riparian ET flux, most of which is within that range. The 20-foot depth to water used here conservatively captures a slightly larger area within which pumping might plausibly affect riparian vegetation.

Several data problems confound the comparison of water levels and vegetation distribution. The first is that currently available water level data are from water supply wells with screened intervals far below the ground surface (often more than 150 feet). Vertical water level gradients are common in developed alluvial basins because recharge occurs at the water table while pumping is from greater depths. This creates downward head gradients. Downward vertical gradients of 0.028 to 0.145 ft/ft were documented for eight shallow-deep well pairs in the San Juan Valley in October 2002 (Yates, 2003). Thus, a depth to water of 20 feet in wells probably corresponds to a smaller depth to the true water table in the root zone. A second issue is that the ground elevation at wells near streams is typically 10-15 feet higher than the bottom of the creek channel. That is, wells are not drilled in the channel itself but on higher terraces or floodplains next to the channel. As a result, a depth to water of 30 feet in a well could correspond to a depth to water of 15-20 feet in the channel itself. A third complexity is the facultative rooting depths of many species, which means that they will grow deeper roots where the water table is deeper. In other words, if the water table is consistently only 5 feet below the ground surface, phreatophytes will only grow roots to a depth of 5 feet. If the water table is consistently deeper, the plants will extend their roots deeper, up to a point that for this analysis is estimated to be 20 feet. For many species, the maximum rate of root elongation is known for seedlings but uncertain for mature shrubs and trees.

A sustained rise in groundwater elevations can also impact riparian vegetation. Raising the water table elevation in an area of established riparian vegetation will tend to shift the vegetation zones through mortality and regeneration over a number of years. There may be mortality of species that prefer slightly larger depths to water (sycamore, box elder, oak), with regeneration in adjoining areas of higher ground. Meanwhile, the areas with shallow water table depths would likely be colonized by species suited to those conditions, such as willow or cottonwood (Strahan, 1984).

Hydrographs of simulated groundwater levels during the second half of the simulation period are shown for twelve wells along the Pajaro River, Miller Canal, Pacheco Creek, and the San Benito River in **Figure 6-5** (see **Figure 6-6** for well locations). Each graph shows future baseline water levels and water levels with the 10 percent reduction in pumping. Historical water levels are also shown to allow a general comparison of simulated future conditions with the range of historical water levels.

Along the Pajaro River and Miller Canal, water levels at the depths of well screens (model layer 3) under the baseline simulation are mostly greater than 40 feet below the ground surface (well 11-4-34A1 in **Figure 6-5**, for example). In the reduced pumping model simulation, water levels increased by 5-10 feet in summer, with no change in winter. Layer 1 water levels are generally less than 20 feet below the ground surface along the Pajaro River, which is consistent with the presence of healthy mature riparian trees along that waterway. Upstream of the Calaveras Fault (at San Felipe Lake) shallow and deep groundwater levels are both less than 20 feet below the ground surface, and flowing wells are present in winter and wet years (see for example well 11-5-28B1 in **Figure 6-5**). The summer baseline depth to water in wells increases upstream, typically exceeding 20 feet upstream of San Felipe Road (well 11-5-26R3 in **Figure 6-5**). Simulated decreased pumping raised water levels 1-2 feet in winter and up to 5 feet in summer in this area. Upstream of the Ausaymas Fault (at Highway 156), the effect of reduced pumping is small: 0-2 feet in summer, decreasing to 0-1 foot near Casa de Fruta (wells 11-5-24C1 and 11-5-12E1 in **Figures 6-5**). The baseline depth to water along this reach is consistently less than 20 feet except during droughts, when it increased to 50-60 feet at all of the wells, even with the pumping reduction. The water level decline during droughts is due primarily to down-valley drainage of groundwater rather than to pumping. Overall, the reach of the Pajaro-Pacheco corridor where

vegetation is most likely to be affected by pumping-related water level changes is probably between San Felipe Road and Highway 156.

Along the San Benito River, the simulated pumping reduction raised water levels from the Pajaro River up to about Bixby Road by roughly 3 feet during droughts and by negligible amounts in other years. Water levels in wells are consistently less than 20 feet below the ground surface, and some flowing wells are present in wet years (wells 12-4-17L20 and 12-4-21M1 in **Figure 6-5**). In the eastern half of the San Juan Valley and continuing up the river to the Calaveras Fault (near Union Road), baseline depths to water are consistently greater than 30 ft (wells 12-4-26G1 and 13-5-4G1 in **Figure 6-5**). The pumping reduction raised water levels by up to 10 feet during droughts, but such a change would not be expected to affect riparian vegetation because of the large depth to water. Baseline groundwater levels are shallower along a three-mile reach upstream of the fault, not quite to the Tres Pinos Creek confluence. In that area, water levels are consistently less than 20 feet below the ground surface, and the pumping reduction had little effect except to raise water levels by up to 2 feet during major droughts (for example, well 13-5-11Q1 in **Figure 6-5,** near Hospital Road). Farther upstream, the pumping reduction had very little effect, raising water levels by up to 2 feet during major droughts and by negligible amounts at other times. Measured water levels throughout the Paicines Valley have almost all been more than 20 feet below the ground surface, with increasing depths toward the upstream end of the valley. Raising those water levels by 2 feet would not substantially increase the extent of riparian vegetation, which is present at narrow gaps in the alluvium where depth to water is relatively small. In summary, the San Benito River reach with phreatophytic vegetation most likely to be affected by changes in pumping would be the reach above the Calaveras Fault near Hospital Road. In the other reaches, the pumping effects are small and the reduced pumping simulation did not significantly change the amount of time that water levels are within versus below the estimated rooting depth of 20 feet.

The effect of groundwater levels on riparian vegetation was also investigated by mapping areas where the depth to water was less than 20 feet in October 1992 and April 1998 of the historical calibration simulation. The results are shown in **Figure 6-6**. Although deep groundwater levels rose by tens of feet between 1992 and 1998 in many parts of the basin, shallow groundwater levels increased only slightly. It should be noted that the simulated water levels are for model layer 1, which is quite thick in places and therefore might have water levels lower than the true water table. Major stream reaches in the shallow water table areas include the Pajaro-Pacheco corridor up to San Felipe Road and from Casa de Fruta to the upstream end of the basin. Under the wetter 1998 conditions, patches of shallow groundwater were also present along Pacheco Creek between Hwy 156 and Walnut Avenue. Along the San Benito River, depths to water less than 20 feet were present downstream of Lucy Brown Road, along the 3-mile reach upstream of Hospital Road, in patches covering about half of Paicines Valley, and along most of Tres Pinos Creek between Los Muertos Creek and Tres Pinos.

The stream reaches with shallow water levels, layer 1 depth to water less than 20 feet, were very similar for 1992 and 1998, even as the deep groundwater levels increased tens of feet. This supports a conclusion that pumping-related changes in water levels occurred almost entirely where depth to water already exceeded 20 feet in both 1992 and 1998 and therefore would not have a large impact on riparian vegetation.

Given the small differences in the extent and elevations of shallow groundwater levels between 1992 and 1998, the simulated riparian evapotranspiration (ET) flux would be expected to also be similar. The Southern and San Juan MAs accounted for about 80 percent of simulated basin-wide ET flux, and the

annual values did not exhibit prominent trends associated with droughts and recovery periods. In the Hollister and Bolsa MAs, ET flux declined by about half during 1987-1992 and recovered by 1998. The combined declines during 1987-1992 amounted to about eight percent of normal basin-wide ET. This relatively small effect is consistent with the water-level changes and suggests that negative water balances during droughts are primarily absorbed by storage changes away from shallow groundwater areas.

6.7.2.4. Air Photos, NDVI and NDMI

Aerial photographs can be used to detect changes in the occurrence of riparian vegetation, such as clearing by in-channel gravel mining, scour by flood events, and regeneration in bare soil areas. Examination of Google Earth images from 1985 to 2018 confirmed the decrease in mining activity from the 1990s to the 2000s, particularly near the lower end of the San Benito River. The extent and density of riparian vegetation increased noticeably in that area following the cessation of mining. Air photos also revealed drought-related vegetation die-back at one location along Tres Pinos Creek that was verified in the field. In general, however, the distribution and density of riparian vegetation visible in aerial photographs has remained about the same over the past several decades.

A reconnaissance level survey of riparian trees in the North San Benito basin was made on April 10, 2019 to look for signs of die-back or mortality lingering from the 2012-2015 drought. Locations that were surveyed included Pacheco Creek at Hwy 156, Walnut Ave and Casa de Fruta; Tres Pinos Creek near the downstream end of Tres Pinos Creek Valley (0.6 mile south of the Highway 25 bridge); San Benito River near Hospital Road and San Juan Bautista; and the Pajaro River near Highway 101. With the exception of the Tres Pinos Creek site, tree mortality during the 2012-2015 drought did not appear to have been above normal. Along Pacheco Creek near Highway 156, for example, about 10 to 20 percent of standing trees had died in recent years, but the living trees—including ones of similar size and position as the dead ones—all appeared healthy and vigorous. Along the lower end of the San Benito River and along the Pajaro River, there were very few standing dead trees. At the impacted Tres Pinos Creek site, 30 to 40 percent of the standing trees had suffered significant die-back or mortality. This impact had been noted in the inspection of aerial photographs. Most of the affected trees were re-sprouting from the base in spring 2019, and new seedlings had sprouted on the gravel bars in 2018, as shown in **Figure 6-7**.

The health and vigor of riparian vegetation cannot be reliably detected in aerial photographs. However, spectral analysis of light reflected from the vegetation does provide that information. Two commonly used metrics of vegetation health and vigor are the normalized difference vegetation index (NDVI) and normalized difference moisture index (NDMI), both of which involve ratios of selected visible and infrared wavelengths. NDVI relates to the greenness of vegetation and NDMI relates to transpiration. The Nature Conservancy compiled these two metrics from historical satellite imagery for riparian vegetation throughout California and incorporated it into the GDE Pulse on-line mapping tool (The Nature Conservancy, 2019b). The vegetation polygons were of “NCCAG compiled from various vegetation mapping databases mostly reflecting vegetation conditions in the early 2000s. For each polygon, the tool displays time series plots of annual summertime NDVI and NDMI during 1985-2019. In northern San Benito County, vegetation mapping is complete along the San Benito River, patchy along the Pajaro River, and mostly missing along Pacheco Creek and other small streams entering the basin.

To test the correlation between groundwater levels, NDVI and NDMI, values of each of those variables in 1992 and 1998 were compiled at the centroid of each of the 729 mapped vegetation polygons within the basin. The NDVI and NDMI values were taken directly from the GDE Pulse tool. Depth to water in

model layer 1 at each polygon was obtained from grids of layer 1 groundwater levels from the 1975-2017 model calibration simulation. The three variables are shown in separate maps in **Figure 6-8a and 6-8b** for the lower and upper halves of the San Benito River reach within the basin. The relationship between the change in groundwater level and the NDVI and NDMI scores is inconsistent. For example, near the lower end of the San Benito River, groundwater levels rose a moderate amount and NDVI and NDMI scores also rose. However, some of the improvement in vegetative conditions in that area was related to a decrease in gravel mining activity. Farther upstream along the reach between about Bixby Road and Nash Road, groundwater levels greatly increased, but NDVI and NDMI scores decreased. However, the water levels in this area remained far below the plausible rooting depth of riparian vegetation, so the lack of correlation with groundwater levels is not surprising (see **Figures 6-5 and 6-6**). Results are also counterintuitive along Tres Pinos Creek between Tres Pinos and Paicines. Groundwater levels rose substantially near the downstream end of that reach, but NDVI sharply declined and NDMI also declined. A little farther upstream, groundwater levels were steady from 1992 to 1998, whereas NDVI declined and NDMI increased. This area includes the location where drought-related tree mortality was observed in April 2019.

A systematic, global test of the correlation between groundwater levels and the two vegetation metrics was implemented by preparing scatterplots of change in NDVI versus change in groundwater level from 1992 to 1998 and change in NDMI versus change in groundwater level. These plots are shown in **Figure 6-9.** For both NDVI and NDMI, scores increased from 1992 to 1998 in the large majority of polygons. However, the data cloud is essentially horizontal, meaning there was no correlation between those increases and the change in groundwater level.

Along the San Benito River, operation of Hernandez Reservoir can also affect riparian vegetation. The reservoir regulates runoff from about 39 percent of the San Benito River watershed area upstream of the basin. Its general mode of operation has been to store water in winter and make releases during several summer months to achieve live flow and groundwater recharge down to target locations within the basin. Depending on the current state of groundwater levels, the target locations have ranged from near Hospital Road down to Lucy Brown Road. The additional summer flows along the San Benito River through the Paicines Valley might explain the smaller change in depth to water during 1992 to 1998 compared to changes along nearby reaches of Tres Pinos Creek, which is unregulated.

This analysis of aerial photographs and NDVI and NDMI scores during 1992 to 1998 supports a conclusion that riparian vegetation extent and vigor was not correlated with groundwater levels. Although drought-related die-back and mortality was documented at one location, that appeared to be the exception rather than the rule, and it is unclear whether the impact was caused by a local decline in groundwater levels versus a cessation of surface flow in that reach of Tres Pinos Creek. This conclusion is consistent with the conclusion based on the evaluation of shallow groundwater levels and ET flux.

6.7.2.5. Stream Flow

Changes in stream flow can affect riparian and aquatic organisms and water supply for downstream users. Current conditions and the effect of pumping on stream flow were evaluated using records from stream gauges and the results of groundwater modeling.

Stream gauges have been operated at five locations within the basin: on Pacheco Creek near San Felipe Road and Walnut Avenue, on Tres Pinos Creek upstream of Tres Pinos, and on the San Benito River below the Tres Pinos Creek confluence and at old Highway 156. The locations of the gauges are shown in

Figure 6-10. Daily flows at the gauge locations can be used to estimate the timing and duration of passage opportunities for adult and juvenile steelhead trout. The groundwater model can be used to simulate the effects of pumping on flow at those locations and other locations along waterways in the basin, but only in terms of monthly average flows. Hydrographs of simulated monthly stream flow at six locations in the basin are shown in **Figures 6-11a and 6-11b**. Simulated flows for the future baseline and reduced-pumping scenarios are shown. For locations at or near one of the stream gauges, monthly averages of the gauged flows are also shown. The difference in pumping between the two simulations is 12.6 cfs basin-wide.

Ultimately, the reduced pumping scenario resulted in changes in Pajaro River outflow at the downstream end of the model (bottom graph in **Figure 6-11b**). Farther upstream, the effect is spread out among numerous streams. Also, the effect accumulates from upgradient parts of the basin toward downgradient areas. Along Pacheco Creek, for example, the change in pumping had no discernible effect at Walnut Avenue but increased downstream to occasionally as much as 3 cfs at San Felipe Lake (**Figure 7a**). Most of the time, the effect at San Felipe Lake was 0-2 cfs. At the gauge on Tres Pinos Creek, the effect of the pumping reduction is imperceptible. However, the fact that the model under-simulates stream flow at that location could conceal some pumping effects. The model also under-simulates stream flow at the San Benito River gauge at Old Highway 156, but the effect of the pumping reduction appears to be similarly negligible.

Geographic patterns in the effect of pumping on stream flow can also be seen in profiles of flow along streams as they approach the downstream end of the model. **Figure 6-12a** shows flow profiles along Pacheco Creek, Miller Canal, and the Pajaro River in June 1992 (dry year), June 1994 (normal year) and June 1998 (wet year). June was selected because it is a time when irrigation pumping is significant and when steelhead smolts might still be passing through. On all three dates, pumping effects were negligible from the upstream edge of the model down to around San Felipe Road. From there to the confluence with Tequisquita Slough at San Felipe Lake, the effect increased to about 1 cfs. That effect remained essentially constant down to the confluence with the San Benito River. Under the wet conditions of 1998, flow increased rather than decreased all the way to the confluence of the San Benito River in all simulations. The effect of reduced pumping was still apparent, however.

Along the San Benito River (**Figure 6-12b**), pumping effects in 1992 and 1994 were negligible upstream of Paicines Valley, increased to about 6 cfs through Paicines Valley and down to Old Highway 156, then decreased farther downstream. In 1998 flow generally increased along the entire length of the river. Pumping effects were not apparent until the San Juan Valley reach, where a difference of about 8 cfs accumulated.

Overall, the 10 percent change in pumping had relatively small effects on stream flow. In no case did it alter the presence or absence of flow.

Note that the appearance of very low flow along the Pajaro River resulted from the omission of surface inflow from the Llagas Subbasin (Uvas Creek and other local streams) in the model. In reality, those inflows contribute substantial flow to the Pajaro River along the reach skirting the edge of the basin. Therefore, the changes in stream flow associated with this magnitude of change in pumping would not likely impact riparian vegetation.

Decreased outflow in the Pajaro River could potentially affect water available for diversion and groundwater recharge in the Pajaro Valley Basin. Over the long term, changes in consumptive use in the North San Benito Basin manifest as an equivalent change in surface outflow in the Pajaro River. The effects on downstream water users would depend on the timing and magnitude of changes in river flow relative to the recharge capacity along the Pajaro River in that basin. However, this theoretical effect does not appear to be of great concern to downstream users. Neither a recent modeling study (Hanson et al., 2014) nor the current basin management plan (Carollo Engineers, 2014) mention upstream depletion of Pajaro River flow as an issue in basin management.

6.7.2.6. Fish Passage

Depletion of stream flow by groundwater pumping could theoretically affect the timing and duration of flows that are large enough to allow migration of steelhead trout between the ocean and spawning areas in the headwaters of Pacheco Creek and the San Benito River. This possibility was investigated by estimating the number of passage days from historically gauged daily flows, then calculating the change in passage days if flows were changed by the amounts shown in the scenario with a 10 percent reduction in pumping. Note that in the simulation, pumping was decreased and the number of passage days increased. It is assumed that an increase in pumping of the same magnitude would result in a proportional decrease in passage days (that is, the relationship between pumping and passage opportunity is roughly linear for small changes in pumping from existing conditions).

South central California coast steelhead adults typically migrate upstream during December-March, and smolts typically migrate downstream during April-June. No studies were found documenting the locations of critical riffles and the minimum flows required for upstream and downstream passage along Pacheco Creek and the San Benito River. Based on the rating curve for Pacheco Creek at the Walnut Avenue gauge and assuming a water depth of 0.7 foot at that location as the minimum depth required for upstream adult migration (Holmes et al., 2014), a minimum passage flow of 31 cfs was estimated. Smolts are smaller and swim with rather than against the current. They can migrate at lower water depths (0.3 foot) and flows, and a minimum passage flow of 6 cfs was assumed for this analysis. The San Benito River channel is broad and sandy, particularly between Highway 156 and Lucy Brown Road. Higher minimum flows were assumed for migration along this reach of the river: 50 cfs for adults and 10 cfs for smolts. The number of days with flow exceeding these minimum values during the corresponding date windows were tabulated for each year for the period of record at each gauge. For the pumping-affected condition, daily flows in Pacheco Creek were increased by 1 cfs, which was the amount associated with a simulated 10 percent reduction in pumping (see flow profiles in **Figure 6-12a**). For the San Benito River, daily flows were uniformly increased by 6 cfs in response to a 10 percent reduction in pumping, consistent with the flow profile along that waterway (**Figure 6-12b**).

The effect of the simulated pumping change of 10 percent on the steelhead adult passage opportunity along Pacheco Creek is shown in **Figure 6-13**. In contrast to the previous figures, this figure is plotted using an increase in pumping rather than a decrease. In 6 out of the 34 years with data, passage opportunity was decreased by 1-3 days. All of those years were ones with an above-average number of passage days to begin with, so the impact on reproductive success would likely be negligible. For smolts (**Figure 6-14**), the number of passage days was decreased by 1-6 days in 16 out of 34 years. Almost all of the reductions were in years when total passage opportunity was greater than the median duration of 17 days. Although the reductions were frequent, they were generally small relative to the overall passage opportunity within the 6-year steelhead lifespan. Thus, this hypothetical scenario might reduce long-term reproductive success for the local population, but the reduction would probably be small.

On the San Benito River at old Highway 156, the simulated 10 percent increase in pumping would decrease adult passage in 24 out of 49 years, by a maximum of 44 days (**Figure 6-15**). Unlike Pacheco Creek, the reductions were not limited to years with above-average numbers of passage days. However, for years with fewer than the median number of passage days (about 7), reductions never exceeded two days. For smolts (**Figure 6-16**) pumping depletion reduced passage in 31 out of 49 years, by a maximum of 44 days. In five years, passage opportunity was decreased to 0 days. The frequency and magnitude of the reductions are substantial and would probably adversely impact the long-term reproductive success of the steelhead population using the San Benito River. However, the results are quite sensitive to the estimate of minimum passage flow for smolts. That flow has not been determined through field studies and is considered a data gap.

The effects of a moderate increase in groundwater pumping on steelhead migration would probably not be significant along Pacheco Creek but could be along the San Benito River if the minimum passage flow is near the estimate of 10 cfs used in the above analysis. The future growth scenario described in Section 8 Projects and Management Actions contemplates possible increases in Hollister municipal use on the order of 10,000 AFY and increased irrigation demand for new vineyards on the order of 4,000 AFY over the next 50 years. All of the irrigation and some of the municipal use would be supplied by groundwater, much of it in areas where increased pumping could affect flow in the San Benito River. Thus, groundwater conditions might not be sustainable with respect to steelhead passage.

6.7.3. Definition of Undesirable Results

The Sustainability Goal includes an objective to support beneficial uses of interconnected surface waters. Consistent with that objective, undesirable results of excessive depletion of surface water are:

- riparian vegetation die-back or mortality during droughts of a magnitude that disrupts ecological functions or causes substantial reductions in populations of riparian-associated species, and
- decreased reproductive success of steelhead trout during droughts beyond an amount that can easily be recovered during subsequent wet periods.

6.7.4. Potential Effects on Beneficial Uses and Users

The analysis presented in this section demonstrates that groundwater conditions are currently sustainable with respect to inter-connected surface water and GDEs, with the possible exception of steelhead smolt migration along the San Benito River. The distribution and health of riparian vegetation shows little correlation with groundwater levels. Basin outflows appear sufficient to meet the needs of downstream water users. Adult steelhead migration is not strongly impacted by changes in pumping, but smolt migration along the San Benito River might be significantly impacted by pumping. These conclusions are based on evaluations of groundwater levels in the range bracketed by 1992 (end of drought) and 1998 (end of wet period) conditions and simulated model results from pumping within 10 percent of current pumping.

6.7.5. Sustainable Management Criteria for Interconnected Surface Water

SGMA requires that "the minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results" (§354.28(c)(6)). However, GSP Regulations allow GSAs to use groundwater elevation as a proxy metric for any of the sustainability indicators when setting minimum thresholds and measurable objectives (23 CCR § 354.28(d) and 23 CCR § 354.30(d)).

It would be difficult to define a minimum threshold in terms of flow depletion in this basin for two reasons. First, phreatophytic riparian vegetation appears to be more correlated with areas where depth to water is consistently shallow than with the magnitude or duration of surface flow. Second, the two streams that potentially support steelhead migration have reaches that go seasonally dry in almost all years interspersed with reaches that are nearly perennial. Pumping impacts on flowing reaches would not alter passage opportunity if upstream or downstream reaches are already naturally dry.

6.7.6. Minimum Threshold

Given the above, the minimum threshold is defined here by groundwater levels. As noted previously, wells in the groundwater levels monitoring program are production wells with relatively deep screens that have not been sited and designed for tracking surface water-groundwater interactions. The lack of such shallow monitoring wells is a data gap and a source of uncertainty. Hence, the minimum threshold described here is initial. Nonetheless, it is intended to be protective of GDEs until the monitoring program can be refined to better represent near-stream shallow conditions. Wells to be included in the initial surface water-groundwater tracking program have been identified as currently monitored wells within 1 mile of a shallow water table reach along specific reaches of the Pajaro River, Pacheco Creek, San Benito River, or Tres Pinos Creek. These reaches and monitoring are shown on **Figure 6-17**. The distribution of monitoring sites is uneven; refinement of the surface water-groundwater tracking program will include not only addition of some dedicated near-stream monitoring wells, but also systematic evaluation of the monitoring points to be representative.

Because stream flow depletion is conceptually dependent on groundwater levels, and fish and vegetation appeared to have weathered the 1987-1992 drought, it is reasonable to set 1992 groundwater levels as the basic metric for sustainability of interconnected surface water. Spring rather than fall water levels were selected for the criterion because they are less affected by short-term pumping cycles, coincide with the season of fish migration, and provide an indication of groundwater availability for phreatophytes during the subsequent dry season.

Therefore, in the North San Benito Basin:

> The **Minimum Threshold** for depletion of interconnected surface water is the amount of depletion associated with the lowest water levels during the 1987-1992 drought, with some adjustments made for wells with groundwater levels lower in 2016 than in 1992.

Specifically, undesirable results would occur if more than 25 percent of monitored wells within 1 mile of a shallow water table reach along the Pajaro River, Pacheco Creek, San Benito River, or Tres Pinos Creek had static spring water levels lower than the lowest static spring water level during 1987-1992. This percentage is considered small enough to detect a problem before it becomes too widespread or

extreme, but large enough to allow for typical variability among wells and among measurement dates (that is, to minimize "false positives"). The minimum threshold is expected to protect beneficial uses of surface water for aquatic and riparian habitat maintenance until additional data are collected to support a more accurate minimum threshold definition.

6.7.6.1. Relationship of Minimum Threshold to Other Sustainability Indicators

- **Groundwater Levels.** Nine of the 20 wells used to evaluate the minimum threshold are also representative wells used for compliance with the minimum threshold for groundwater levels. The groundwater level minimum threshold involves two consecutive quarterly water-level measurements rather than a single spring measurement. However, both thresholds are based on historical water levels. For the wells included in both sets of criteria, the interconnected surface water threshold water levels are generally the same or higher than the water-level thresholds. That is, along the GDE stream reaches, the interconnected surface water criteria restrict water-level declines more than the water-level criteria do. This is the logical result of the different objectives of the two sets of criteria.
- **Groundwater Storage.** The minimum threshold interconnected surface water would similarly be more restrictive than the minimum threshold for groundwater storage near GDE reaches, because the latter is functionally the same as the minimum threshold for water levels.
- **Seawater Intrusion.** Seawater intrusion would not occur in the North San Benito Basin due to its inland location. No minimum threshold was defined and there is no consistency issue.
- **Land Subsidence.** Significant land subsidence is only likely to occur with groundwater levels below historical minimum levels. The levels specified as minimum thresholds for interconnected surface water are within the historical range and thus unlikely to cause subsidence.
- **Water Quality.** Water quality issues in the North San Benito Basin are primarily associated with dispersed loading of nitrate and salinity and long-term increases in ambient concentrations of those constituents. Those processes are generally independent of groundwater levels. Groundwater outflow is an important mechanism for salt removal that requires relatively high groundwater levels on a long-term average basis. High levels and groundwater discharge into streams also benefit riparian vegetation and aquatic habitat. Therefore, the minimum threshold for interconnected surface water is consistent with the minimum threshold for water quality.

6.7.6.2. Effect of Minimum Threshold on Sustainability of Adjacent Areas

The only adjoining groundwater basin is the Llagas Subbasin located across the Pajaro River from the Bolsa Management Area. Groundwater consistently flows from the Llagas Subbasin toward the Bolsa MA. If Bolsa water levels were lowered, outflow from the Llagas Subbasin would increase. The water levels used to define the minimum threshold for depletion of interconnected surface water are within the historical range of water levels and thus would not cause unreasonable impacts on groundwater availability in Llagas. By protecting vegetation and fish migration along the Pajaro River—which is a shared boundary between the subbasins—the minimum threshold will protect those resources for the benefit of both subbasins.

The Pajaro Valley groundwater basin is not immediately adjacent to the North San Benito Basin, but it is located downstream along the Pajaro River, which supplies a significant amount of recharge. Recent hydrogeologic and groundwater planning studies for the Pajaro Valley basin have not identified upstream depletion of river flow as a water supply concern. Therefore, maintaining flow depletion within the historical range is presumed to be sustainable with respect to the Pajaro Valley basin.

6.7.6.3. Effect of Minimum Threshold on Beneficial Uses

Surface diversions are not a source of supply in the north San Benito Basin; all water uses are supported by imported water or groundwater. Depletion of surface flow could impact downstream groundwater users if it reduced recharge from stream percolation in those areas. However, the minimum threshold at least limits the depletions to rates within the historical range of experience. With respect to groundwater, this GSP does not propose increases in groundwater pumping above existing amounts, so groundwater levels are expected to remain within the historical range. In areas where the minimum-threshold water level for interconnected surface water is higher than the minimum-threshold for chronic lowering of groundwater levels, the interconnected surface water threshold improves groundwater availability.

The minimum threshold is expected to protect beneficial uses of surface water for aquatic and riparian habitat maintenance. The few springs in the interior of the basin that could plausibly be affected by pumping (along Tequisquita Slough and San Juan Creek) are on the upgradient side of the Calaveras and San Andreas faults, where shallow water levels are relatively stable. Along stream reaches in red-legged frog habitat (San Benito River upstream of Bird Creek and Tres Pinos Creek between Tres Pinos Creek Valley and Southside Road), the lowest simulated water levels in the future baseline scenario were under 1992 conditions and were equal to or higher than historical water levels at that time.

The Pajaro River Wetlands Mitigation Bank is adjacent to a stream reach identified as a riparian vegetation GDE and hence is covered by the minimum threshold for depletion of interconnected surface water. It includes approximately 100 acres of wetland, much of which is seasonal (Wildlands, Inc. 2021). Groundwater conditions are highly confined in the Bolsa area where the wetland is located. Historical groundwater levels in the nearest monitored well (11S/4E-26B1) are close to the ground surface, exhibit no long-term declines and have modest declines during droughts. The lowest spring water level during 1987-1992 (which is the MT definition) was only 20 ft below the ground surface. The water table elevation near the ground surface is certainly higher and more stable. The wetland was established after 1992, but there is no reason to expect any adverse effect associated with groundwater levels if they decline to the MT in the future.

6.7.6.4. Relationship of Minimum Threshold to Regulatory Standards

Other than SGMA, there are no local, state, or federal regulations that specifically address stream flow depletion by groundwater pumping. The California and Federal Endangered Species Acts protect species listed as threatened or endangered, including steelhead trout and red-legged frogs. The minimum threshold for depletion of surface water is designed to prevent stream flow conditions from impacting those species beyond the level of impact that has historically occurred.

6.7.6.5. How the Minimum Threshold Will Be Monitored

Nineteen wells that are currently monitored for water levels by SBCWD are within 1 mile of stream reaches where spring depth to water is typically 20 feet or less and are not separated from the reach by a fault. The locations of the wells are shown in **Figure 6-17**, and the spring 1992 water levels for those wells are listed in **Table 6-6**. Where measured water levels were not made, water levels were estimated

from nearby wells. In the Southern MA—where monitoring did not begin until after 1992—water levels in that year were estimated based on simulated differences between 1992 and 2015 water levels.

The wells in **Table 6-6** are all water supply wells with relatively deep screens. They are useful for relating future conditions to historical ones, but they do not provide a reliable indication of the true water table elevation near the ground surface. Shallow monitoring wells are needed in riparian areas to provide accurate water table information and elucidate the relationship between deep water levels and vegetation conditions. A monitoring improvement for this GSP would be to install shallow monitoring wells at several riparian locations in the basin. Over time, minimum threshold groundwater elevations for the new shallow wells can be defined based on the monitored data and the relationship to deep water levels.

Table 6-6. Minimum Threshold Spring Groundwater Elevations for Interconnected Surface Water

Surface Water / GDE	Spring MT		Source of Elevation
Key Well	Groundwater Elevation (ft NAVD88)	Depth to Water (ft)	
11-4-26B1	127	18	Measured[1]
11-4-34A1	128	14	Measured[1]
11-5-13D1	214	44	Measured[1]
11-5-20N1	90	61	Measured[1]
11-5-27P2	122	64	Measured
11-5-28B1	128	39	Measured
12-4-17L20	113	27	Measured
12-4-21M1	120	51	Measured
12-4-26G1	114	96	Measured
12-4-34H1	117	82	Measured
13-5-11E1	220	87	Measured
13-5-13F1	316	31	Measured
13-6-19J1	412	38	Measured
13-6-19K1	341	81	Measured
DONATI 2	633	63	Estimated[2]
RFP VINEYARD 3	637	69	Estimated[2]
RIDGEMARK 5	618	50	Estimated[2]
RIDGEMARK 7	624	68	Estimated[2]
SCHIELDS 4	620	62	Estimated[2]

1. Water levels in this area were lower in 2016 than in 1992. The measured spring 2015 or 2016 water level is shown, whichever was lower, or the estimated water level based on nearby wells.

2. 1992 water level estimated from measured 2015 water level based on differences in simulated water levels for those two years.

6.7.7. Measurable Objective

The measurable objective for interconnected surface water is an amount of depletion that is less than the amount specified as the minimum threshold. Given the weak correlation between groundwater levels and vegetation health, no specific rise in shallow groundwater levels or increase in stream flow is identified as providing a preferred set of GDE conditions.

Groundwater conditions with respect to interconnected surface water and most GDE parameters are already sustainable. The minimum threshold water levels for interconnected surface water will prevent any decrease in passage opportunity for steelhead smolts along the San Benito River until studies identify the flow requirements for passage more accurately. Therefore, no interim milestones are needed to achieve sustainability at this time.

6.7.7.1. Discussion of Monitoring and Management Measures to be Implemented

Two actions are needed to better quantify the relationship between groundwater levels and habitat conditions. The first is to install shallow piezometers that measure water table depth at approximately four locations where riparian vegetation might potentially be impacted by pumping. Locations would be selected and piezometers installed during the first 5-year implementation period. Example locations might include the Pajaro River, Pacheco Creek near San Felipe Road, the San Benito River near Lucy Brown Road, the San Benito River in the Paicines Valley, and Tres Pinos Creek near Highway 25. The wells would be added to the overall water-level monitoring program.

The second action is to conduct a field study to identify the critical riffle that limits fish passage opportunity along the San Benito River and estimate the minimum flow required to allow passage over the riffle. This study can be completed during the first 5-year implementation period and support a refinement of the interconnected surface water minimum threshold during the 5-year GSP update process.

Potential management actions to reduce impacts to steelhead smolt passage along the San Benito River—which appears to be the most sensitive aspect of interconnected surface water—include:

- Change land use designations, obtain conservation easements or implement other land-use management measures designed to minimize future increases in groundwater pumping along the San Benito River upstream of the critical riffle that might reduce passage opportunity.
- Cooperate with other agencies to control invasive vegetation in riparian areas. Although this would benefit overall habitat conditions, it would not be a substitute for adequate flows.
- Restrict groundwater pumping near the critical riffle when San Benito River flow is receding through the minimum passage flow. This would be contingent on the results of the fish passage study and an evaluation of the expected benefits of short-term pumping reductions on base flow.
- In extreme drought conditions with evident and widespread mortality of riparian vegetation (which would only occur if the minimum threshold water levels for interconnected surface water are grossly exceeded), irrigate selected areas of riparian vegetation to provide ecological refugia and nuclei for riparian recovery following the drought.
- Site, design and operate groundwater recharge projects to have multiple benefits including aquatic/riparian habitat protection.

Two additional potential management measures were considered at a conceptual level and dismissed as impractical or ineffective. One would be to preferentially deliver CVP water to irrigated lands near GDE reaches, to reduce local groundwater pumping and stream flow depletion. In addition to the negligible to weak relationship between groundwater levels and riparian vegetation vigor revealed by the GDE Pulse data analysis, agricultural CVP water is largely unavailable during prolonged drought periods when this intervention would be most needed. This measure would not likely be effective.

A second potential measure would be to reoperate Hernandez Reservoir to retain more water in storage in normal and wet years in order to increase releases in dry years when vegetation and passage impacts would be greatest. A reservoir operations study found that this type of operation would increase the frequency and magnitude of spills from the reservoir and decrease long-term total groundwater recharge along the San Benito River below the reservoir. A decrease in recharge would tend to lower groundwater levels and decrease groundwater discharge into gaining reaches (which are GDE reaches). As a result, this concept does not appear to offer a net benefit to habitat conditions for fish and riparian vegetation.

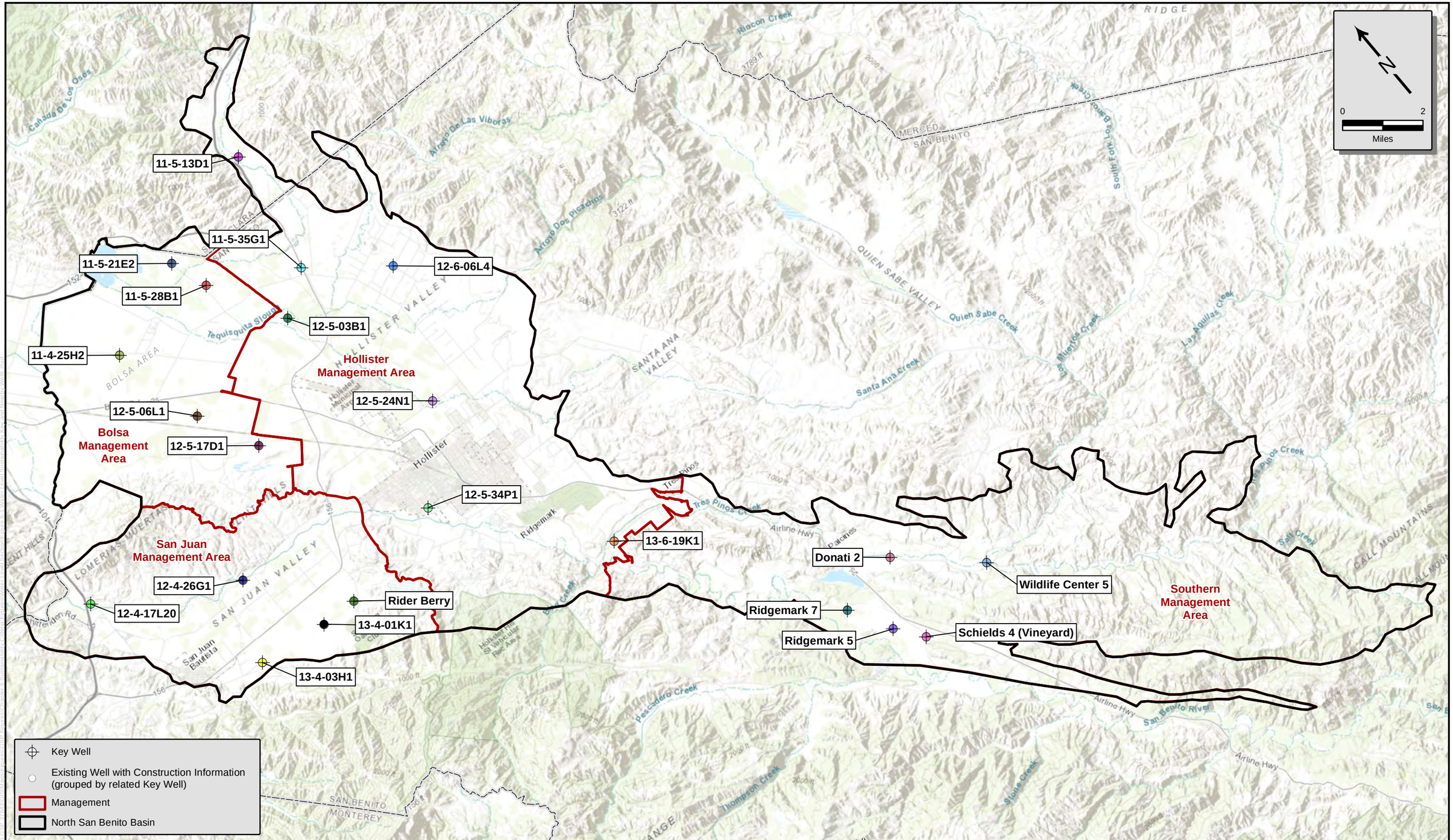


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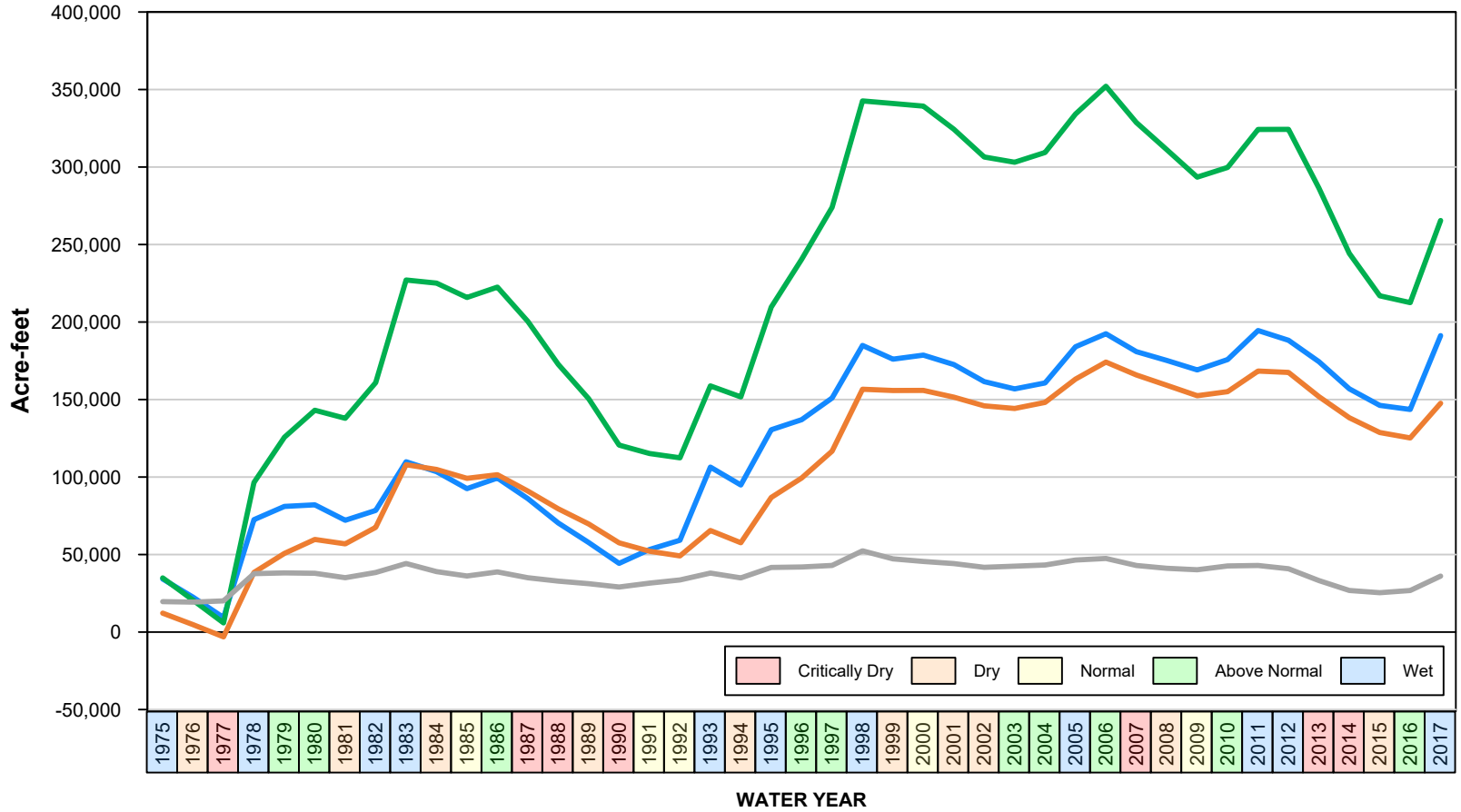
Figure 6-1
Water Level Sustainability Criteria Key Wells and Nearby Wells



Bolsa Management Area
Hollister Management Area
San Juan Management Area
Southern Management Area

November 2021

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Figure 6-2
Historical and Current Change in Storage

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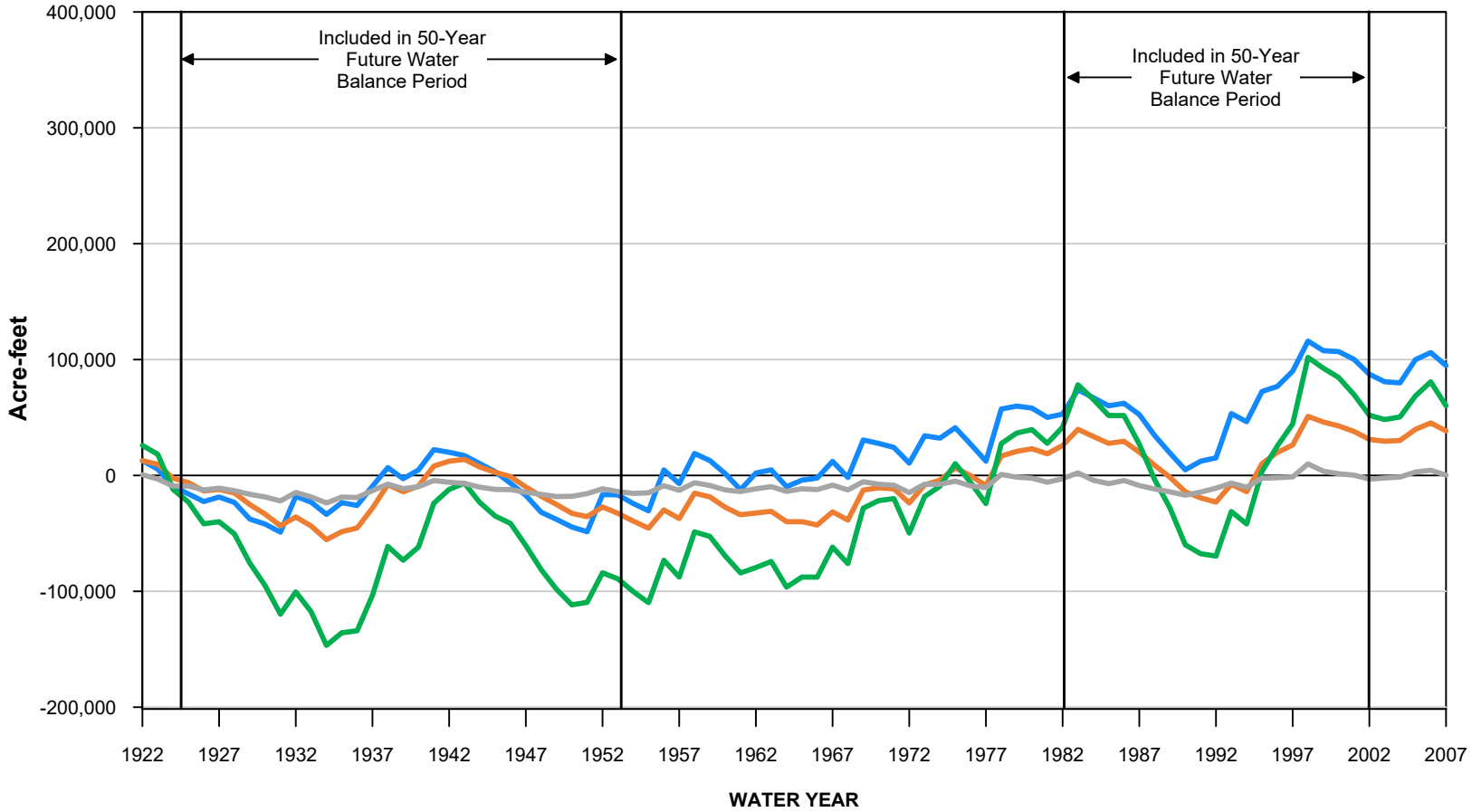

Bolsa Management Area
Hollister Management Area
San Juan Management Area
Southern Management Area

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Figure 6-3
Future Change in Storage

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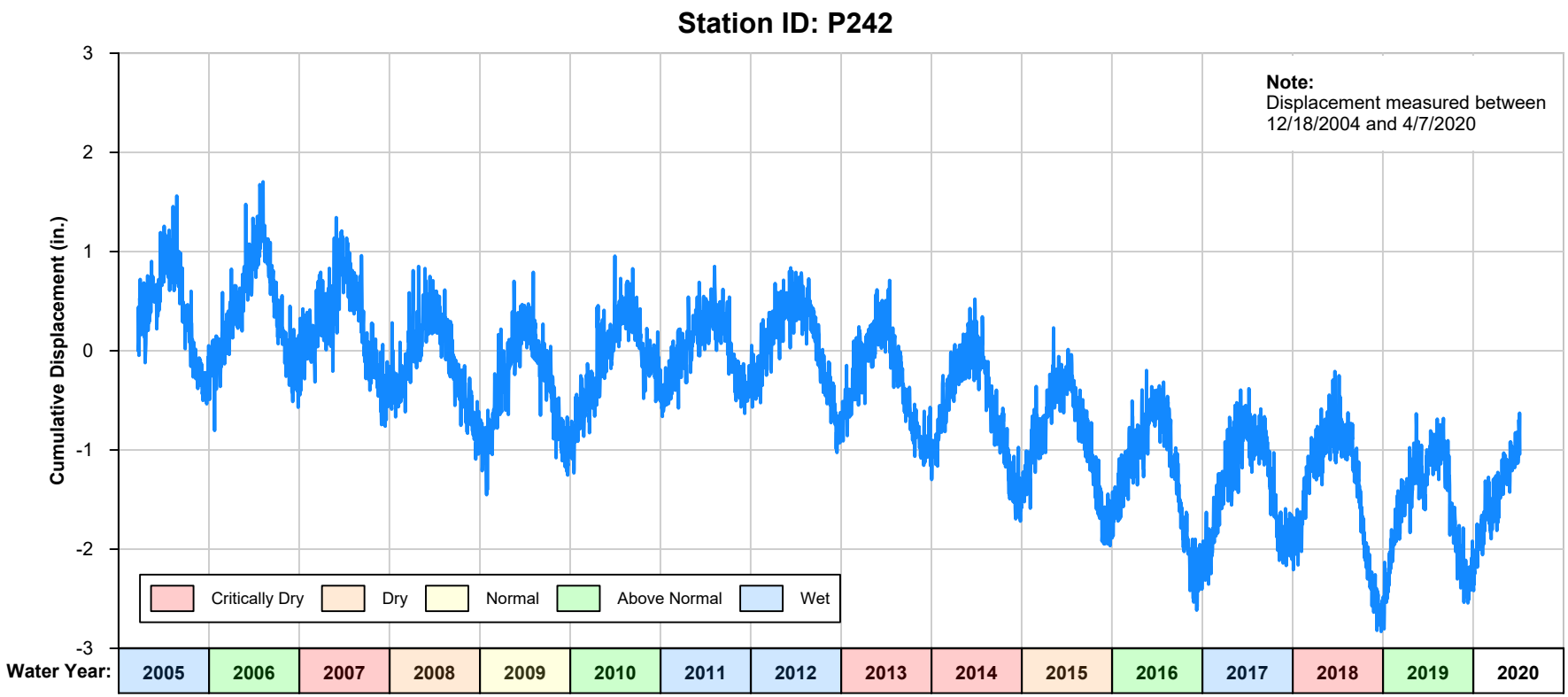

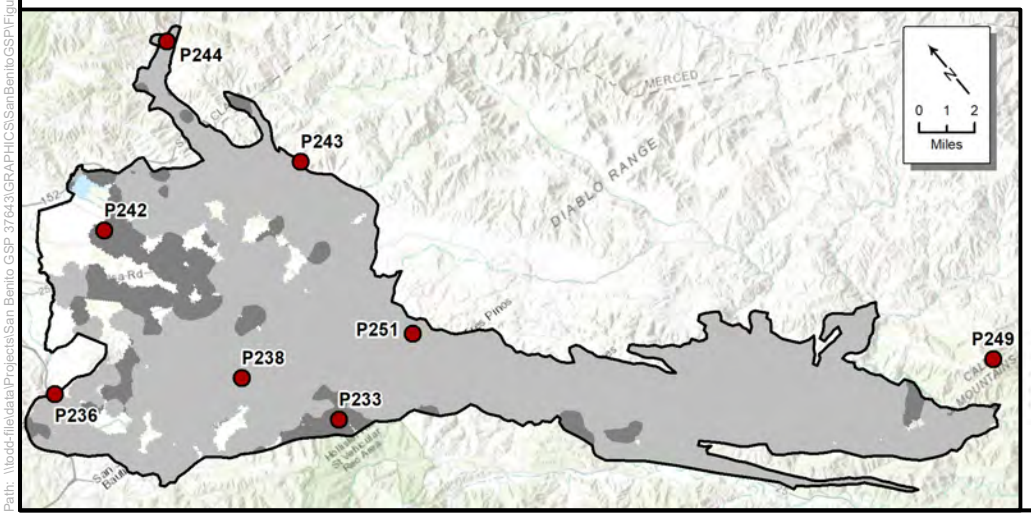

Figure 6-4
Historical Ground Surface Elevation from GPS Monitoring

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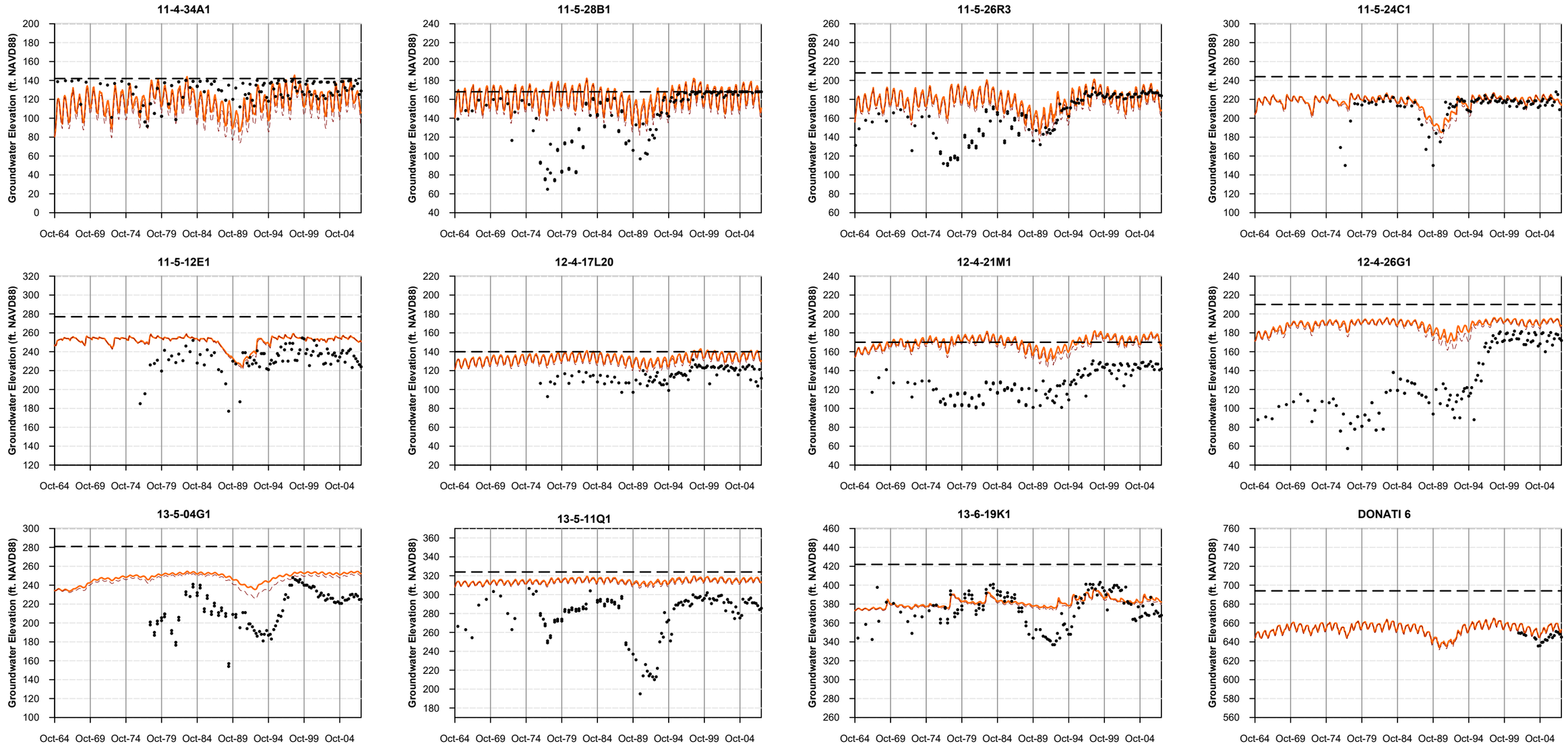

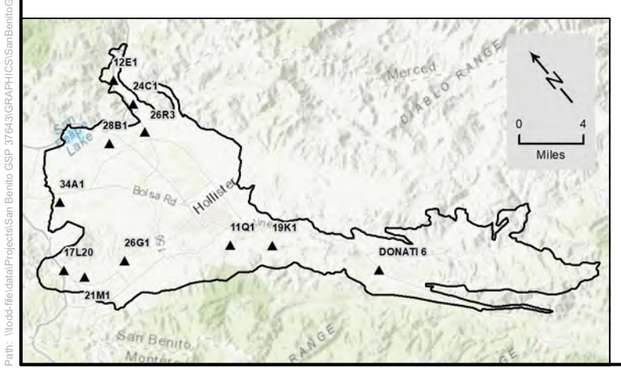

- Historical
- 10% Pumping Reduction
- Future Baseline
- Ground Surface

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Figure 6-5
Hydrographs of Future Baseline and Reduced Pumping Scenarios

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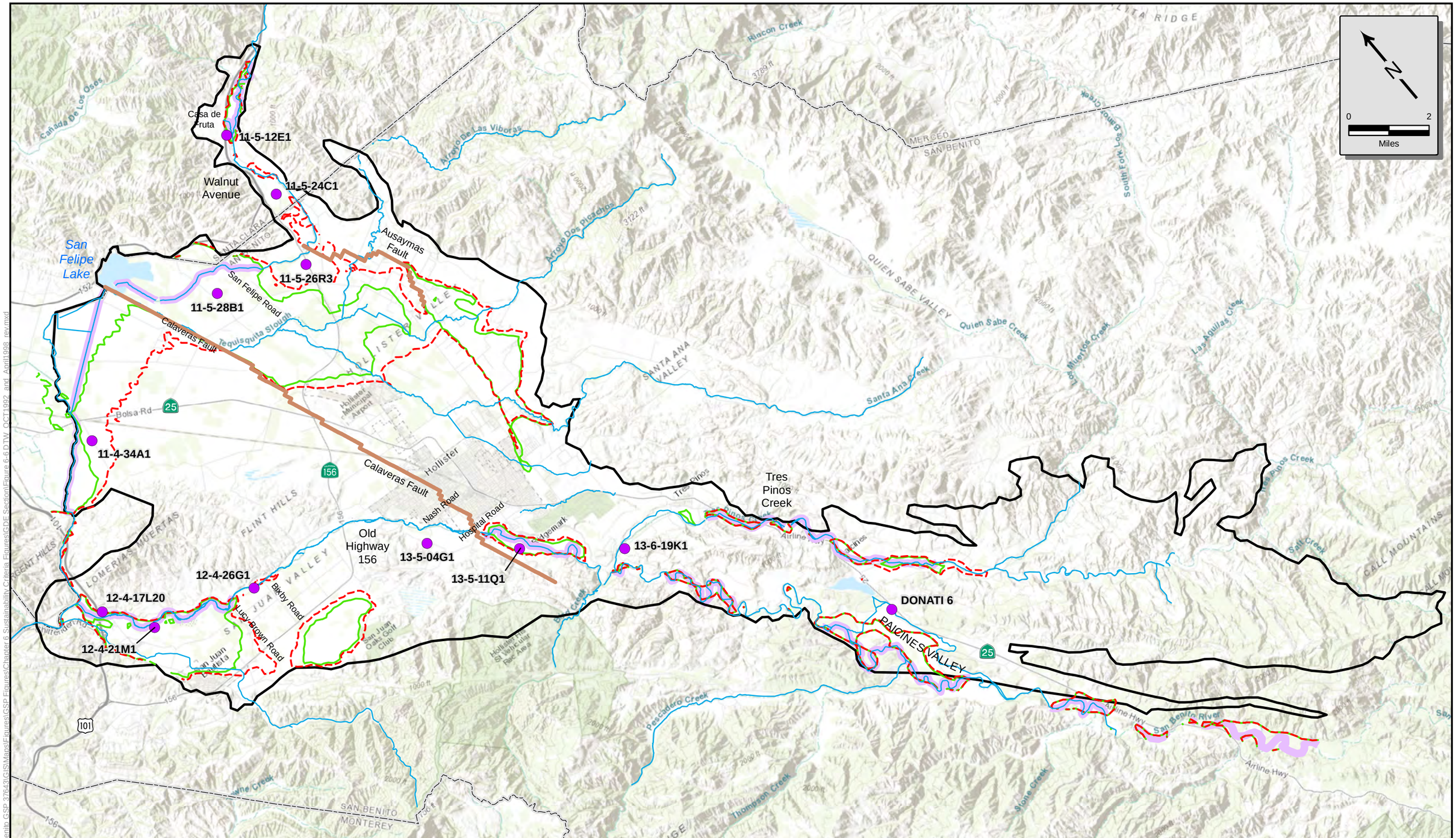

Hydrograph Well

April 1998 Depth to Water = 20 ft

October 1992 Depth to Water =20 ft

Gaining reach (potential riparian GDE)

Major Fault

North San Benito Basin

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Figure 6-6
Depth to Water
October 1992 and
April 1998

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Figure 6-7
Drought-Related Tree Mortality along Tres Pinos Creek

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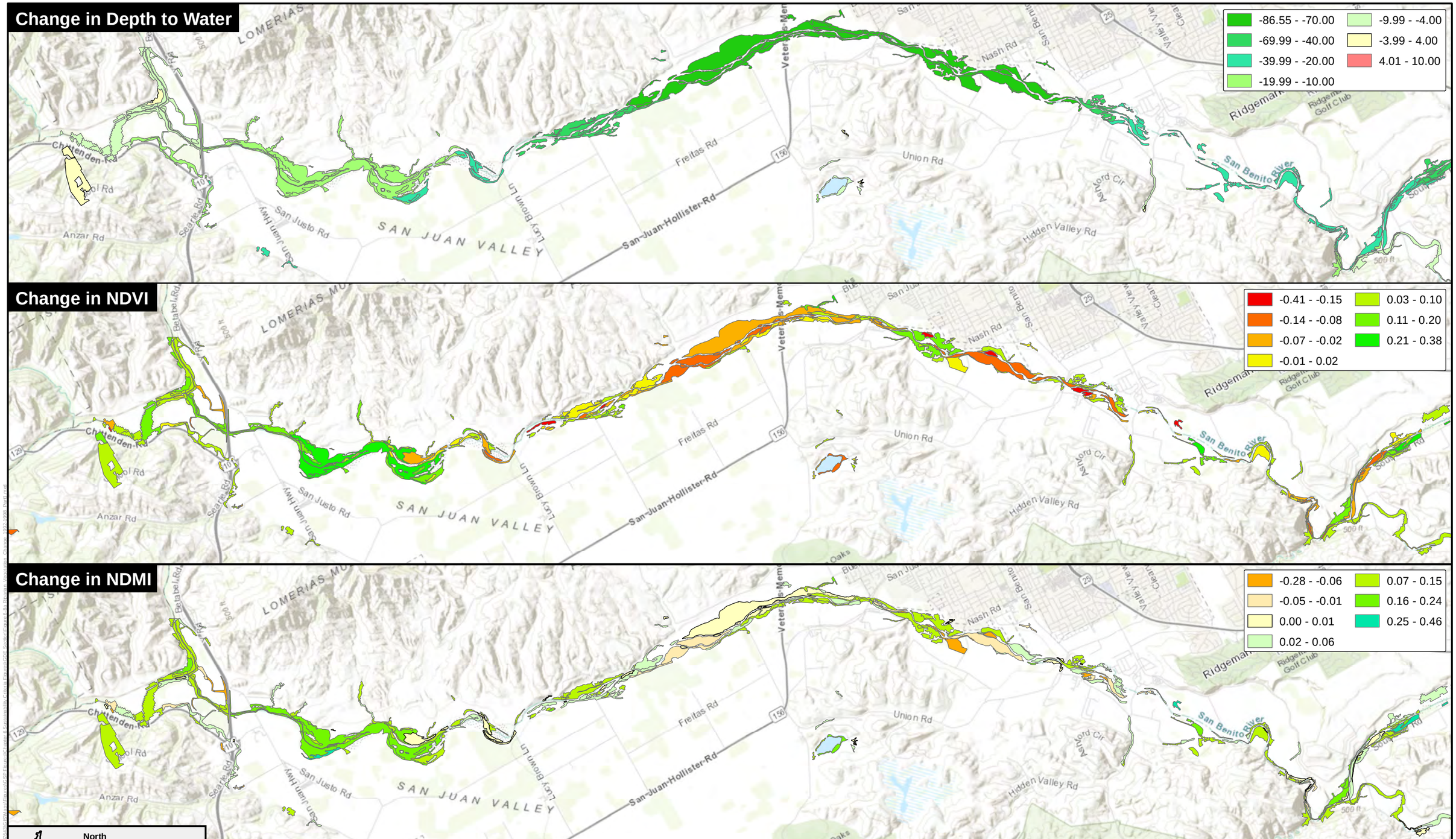

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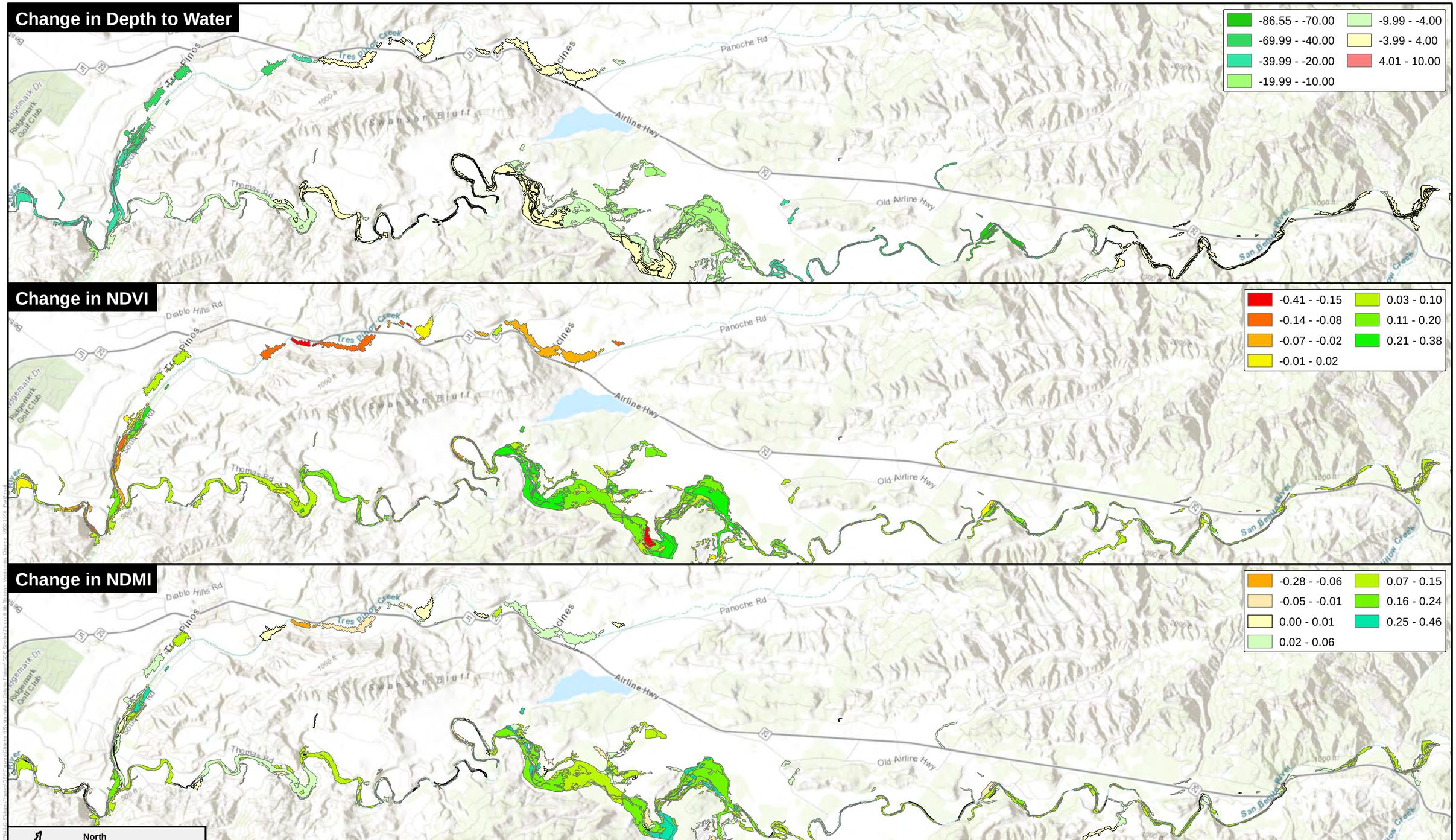
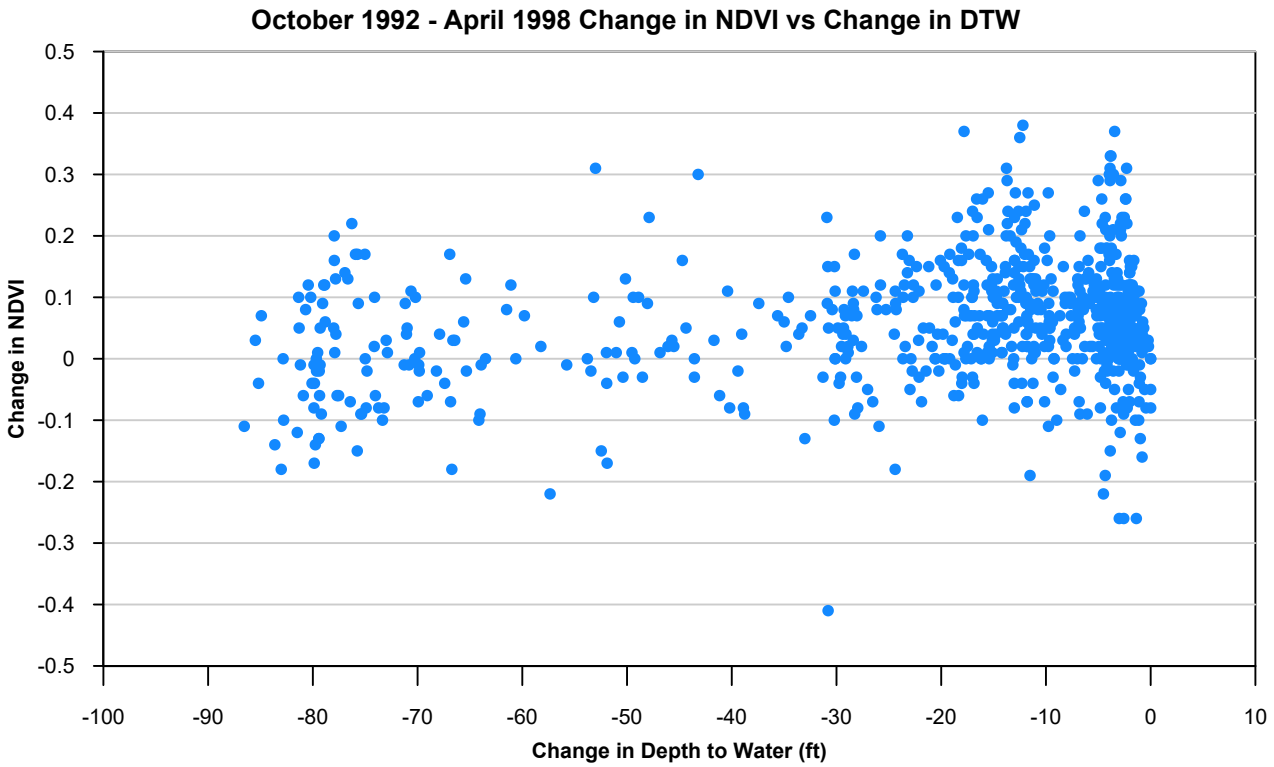
Figure 6-8a
Riparian Vegetation Change
1992 to1998

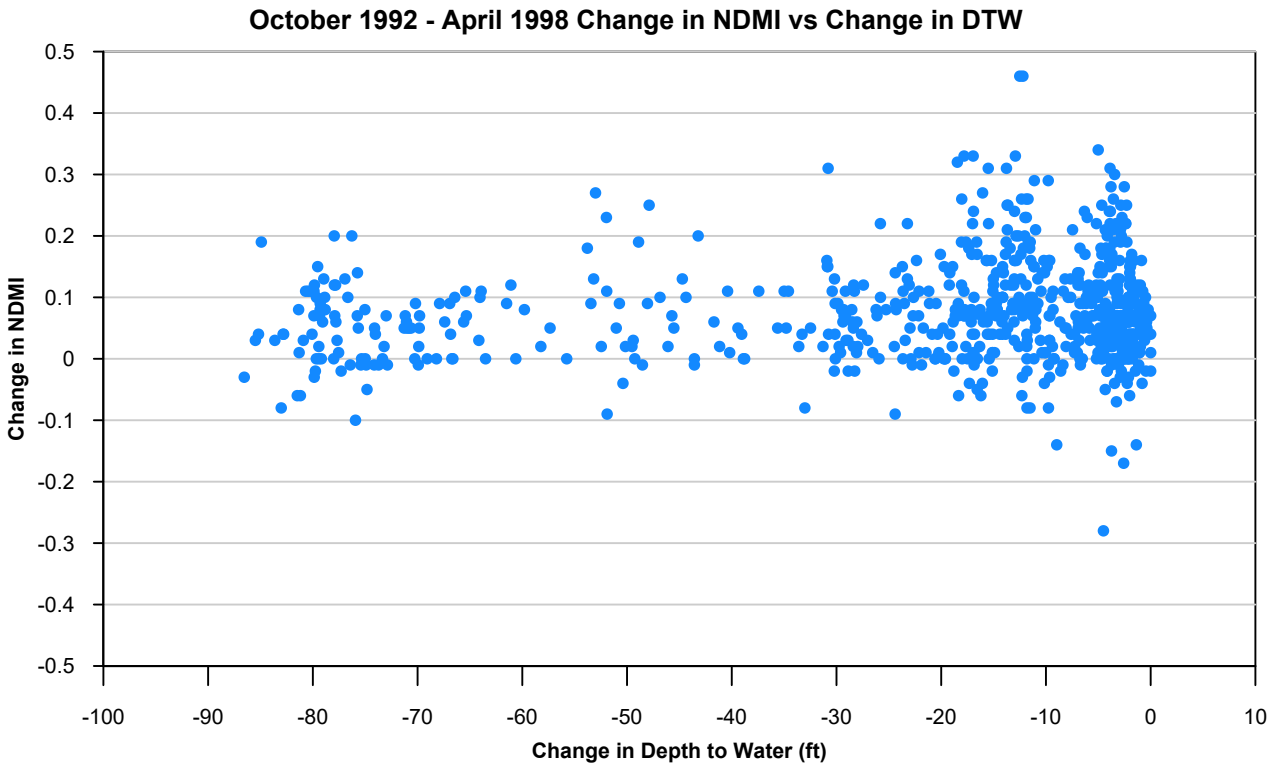


November 2021

TODD GROUNDWATER

Figure 6-8b
Riparian Vegetation Change
1992 to1998





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T:\Projects\San Benito GSP 37643\Data\GDE\NDVI-NDMI-DTW_correlation.xlsx

November 2021

TODD GROUNDWATER

Figure 6-9
Relationships of NDVI and NDMI to Groundwater Level

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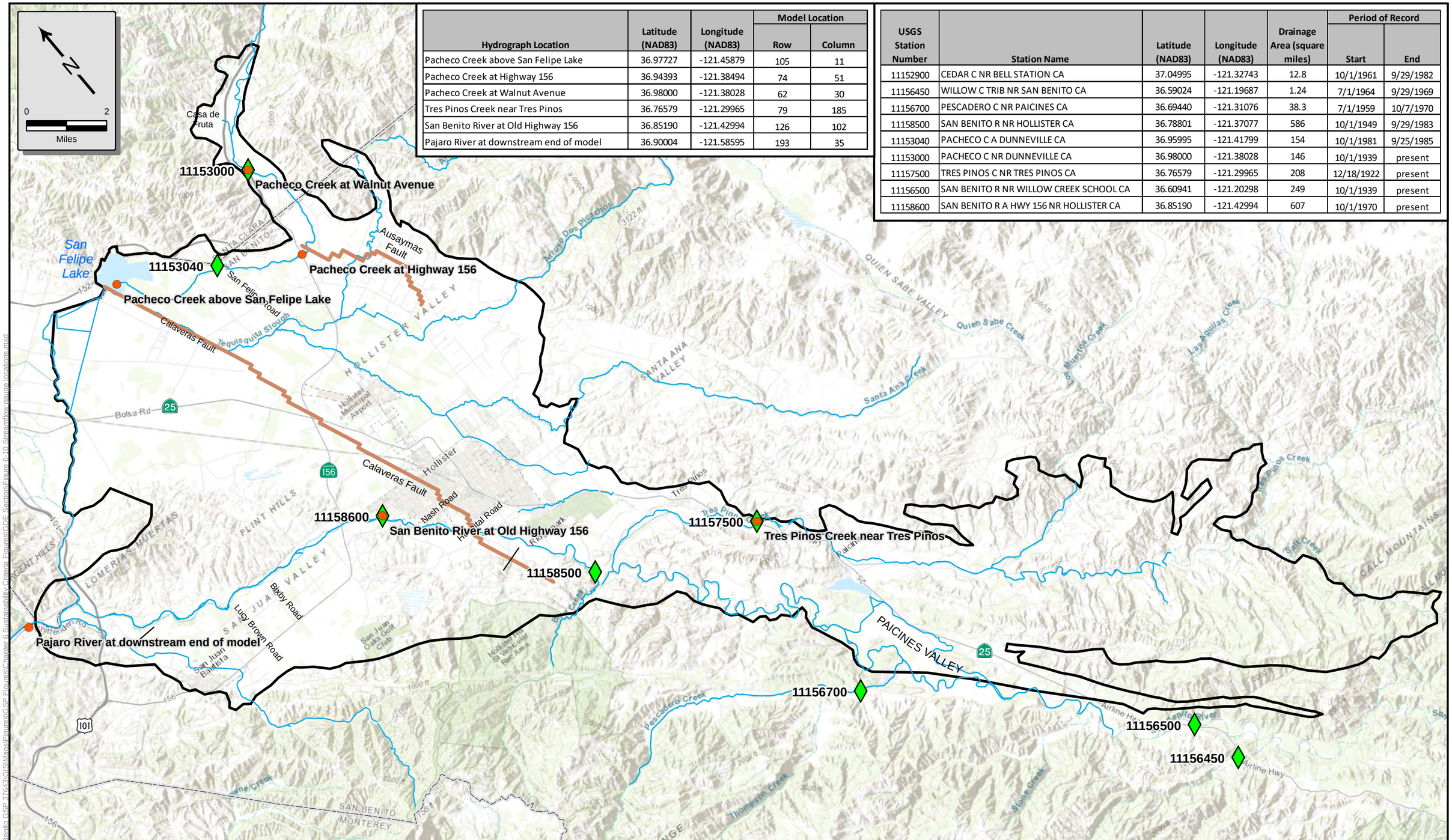
Hydrograph Location	Latitude (NAD83)	Longitude (NAD83)	Model Location	
			Row	Column
Pacheco Creek above San Felipe Lake	36.97727	-121.45879	105	11
Pacheco Creek at Highway 156	36.94393	-121.38494	74	51
Pacheco Creek at Walnut Avenue	36.98000	-121.38028	62	30
Tres Pinos Creek near Tres Pinos	36.76579	-121.29965	79	185
San Benito River at Old Highway 156	36.85190	-121.42994	126	102
Pajaro River at downstream end of model	36.90004	-121.58595	193	35

USGS Station Number	Station Name	Latitude (NAD83)	Longitude (NAD83)	Drainage Area (square miles)	Period of Record	
					Start	End
11152900	CEDAR C NR BELL STATION CA	37.04995	-121.32743	12.8	10/1/1961	9/29/1982
11156450	WILLOW C TRIB NR SAN BENITO CA	36.59024	-121.19687	1.24	7/1/1964	9/29/1969
11156700	PESCADERO C NR PAICINES CA	36.69440	-121.31076	38.3	7/1/1959	10/7/1970
11158500	SAN BENITO R NR HOLLISTER CA	36.78801	-121.37077	586	10/1/1949	9/29/1983
11153040	PACHECO C A DUNNEVILLE CA	36.95995	-121.41799	154	10/1/1981	9/25/1985
11153000	PACHECO C NR DUNNEVILLE CA	36.98000	-121.38028	146	10/1/1939	present
11157500	TRES PINOS C NR TRES PINOS CA	36.76579	-121.29965	208	12/18/1922	present
11156500	SAN BENITO R NR WILLOW CREEK SCHOOL CA	36.60941	-121.20298	249	10/1/1939	present
11158600	SAN BENITO R A HWY 156 NR HOLLISTER CA	36.85190	-121.42994	607	10/1/1970	present



Stream Gauges in Basin

Stream Hydrograph Location

Major Fault

North San Benito Basin

November 2021

TODD GROUNDWATER

Figure 6-10
Stream Flow Gauge and Hydrograph Locations

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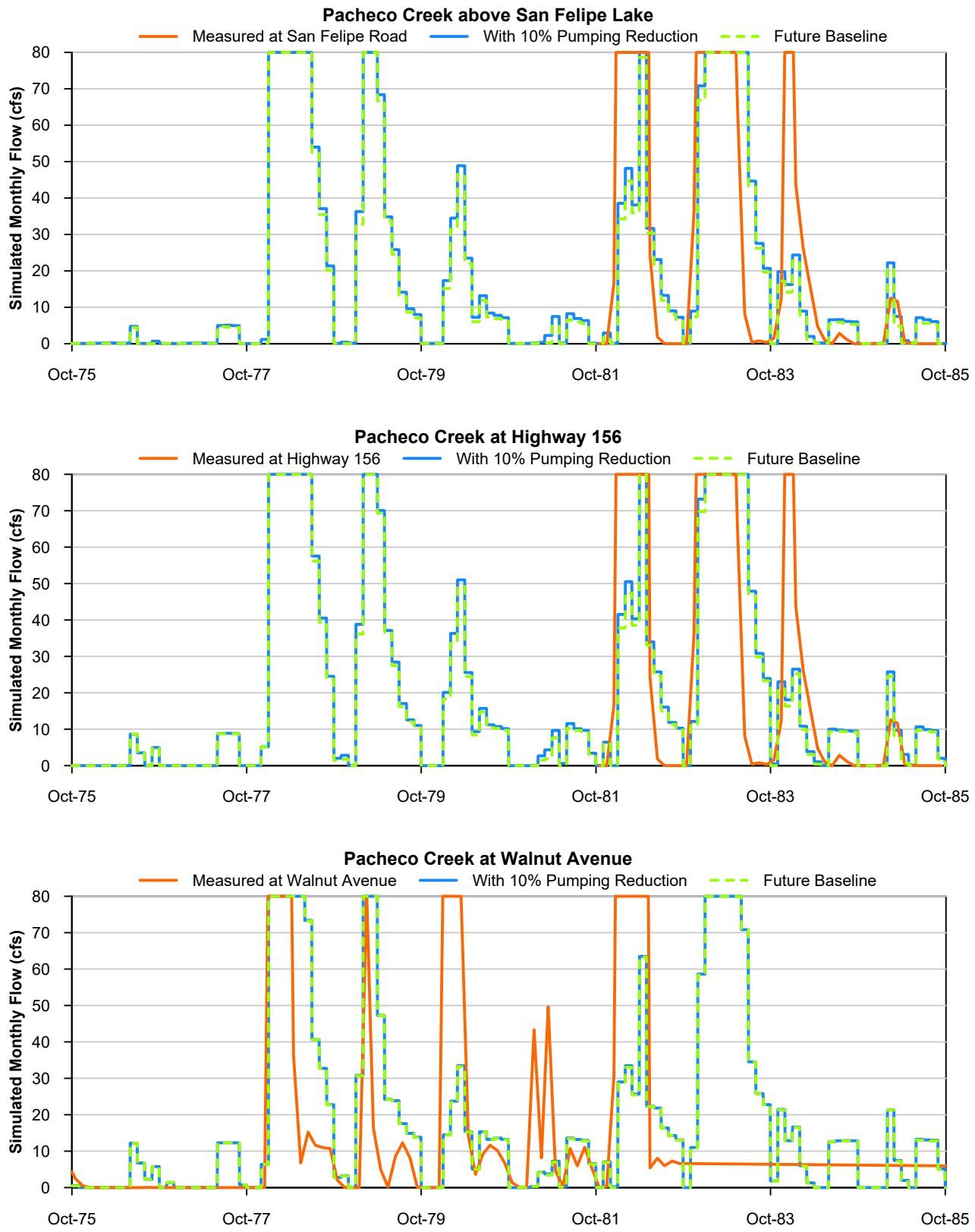


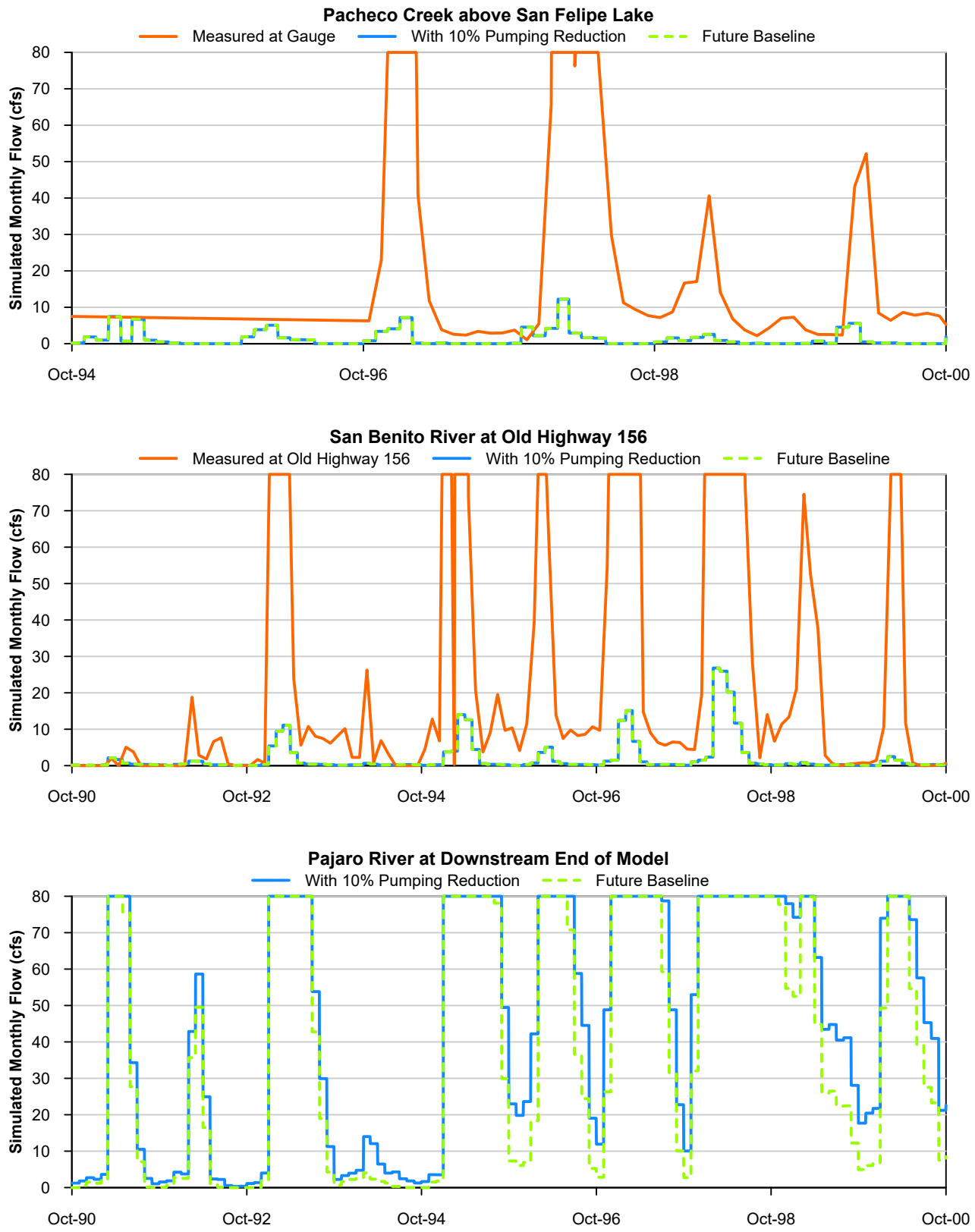
Data:
T:\Projects\San Benito GSP 37643\Model_1922-2007\GWV\
SB7517_gage_str_35locations2.xlsx

November 2021

TODD GROUNDWATER

Figure 6-11a
Simulated Monthly Stream Flow at In-Basin Locations

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure 6-11a Simulated Monthly Stream Flow at In-Basin Locations.gpj



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SB7517_gage_str_35locations2.xlsx

November 2021

TODD GROUNDWATER

Figure 6-11b
Simulated Monthly Stream Flow at In-Basin Locations

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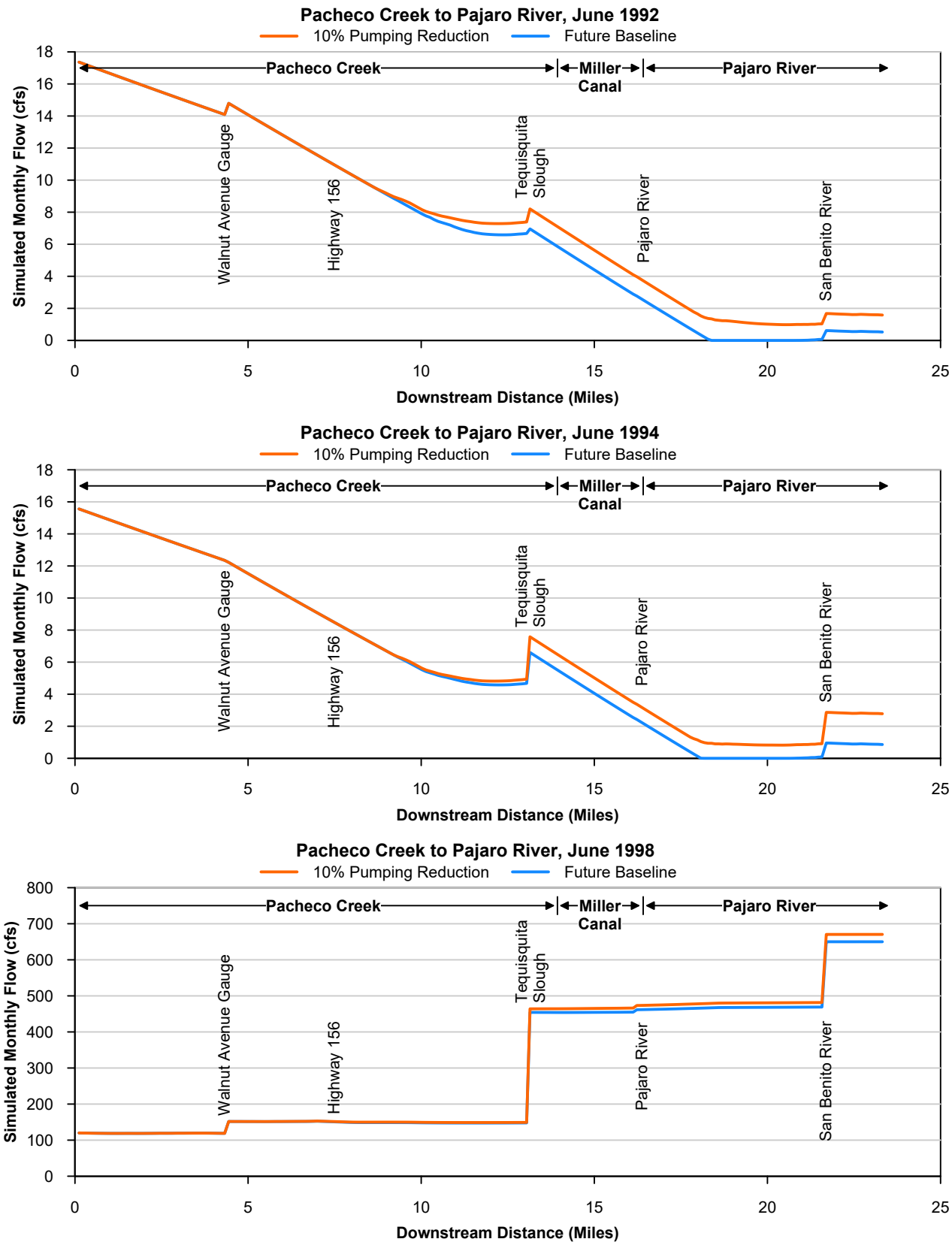

Data:
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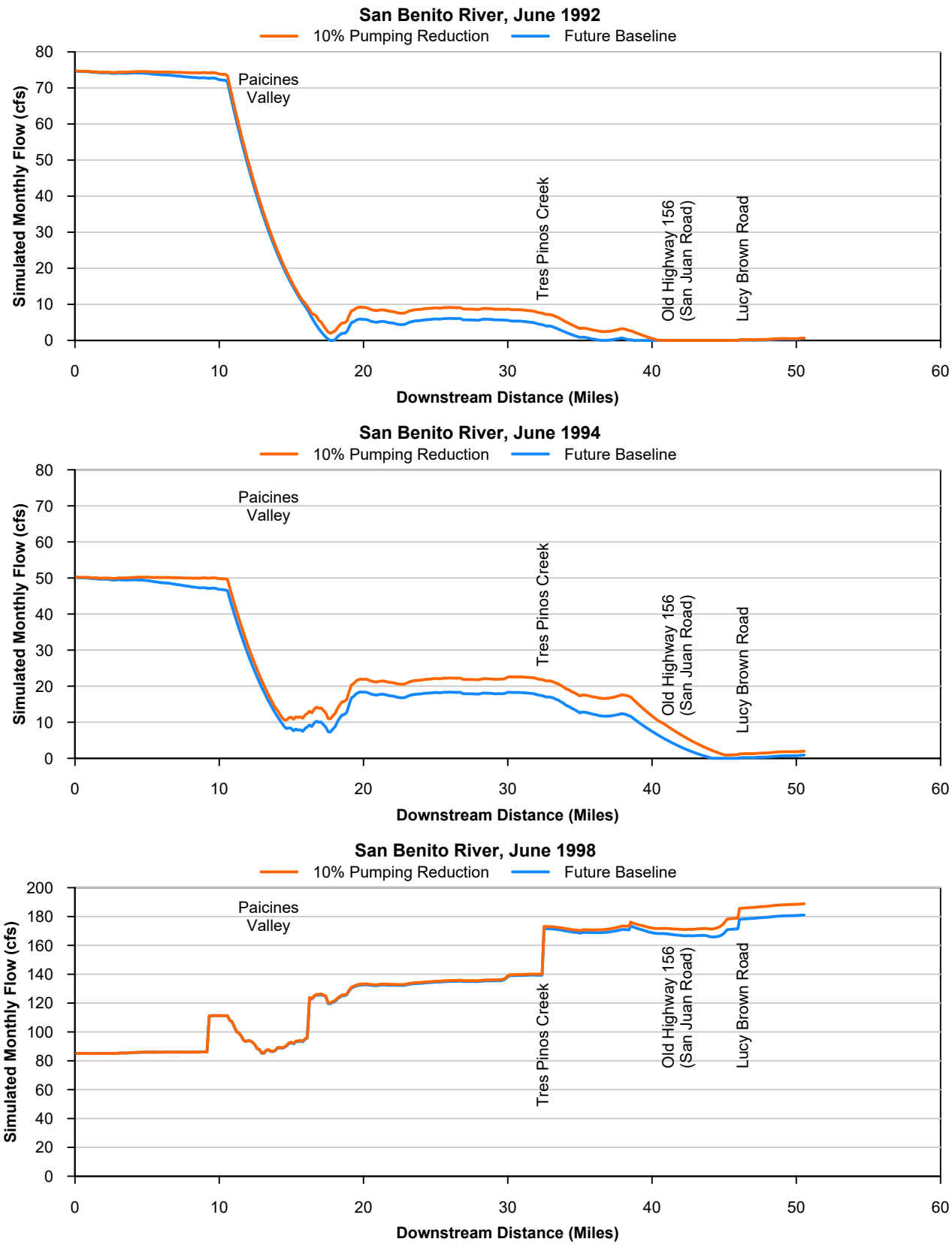
November 2021

TODD GROUNDWATER

Figure 6-12a
Flow Profile along the San Benito River

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure 6-12a Flow Profile along the San Benito River.gpj



Data:
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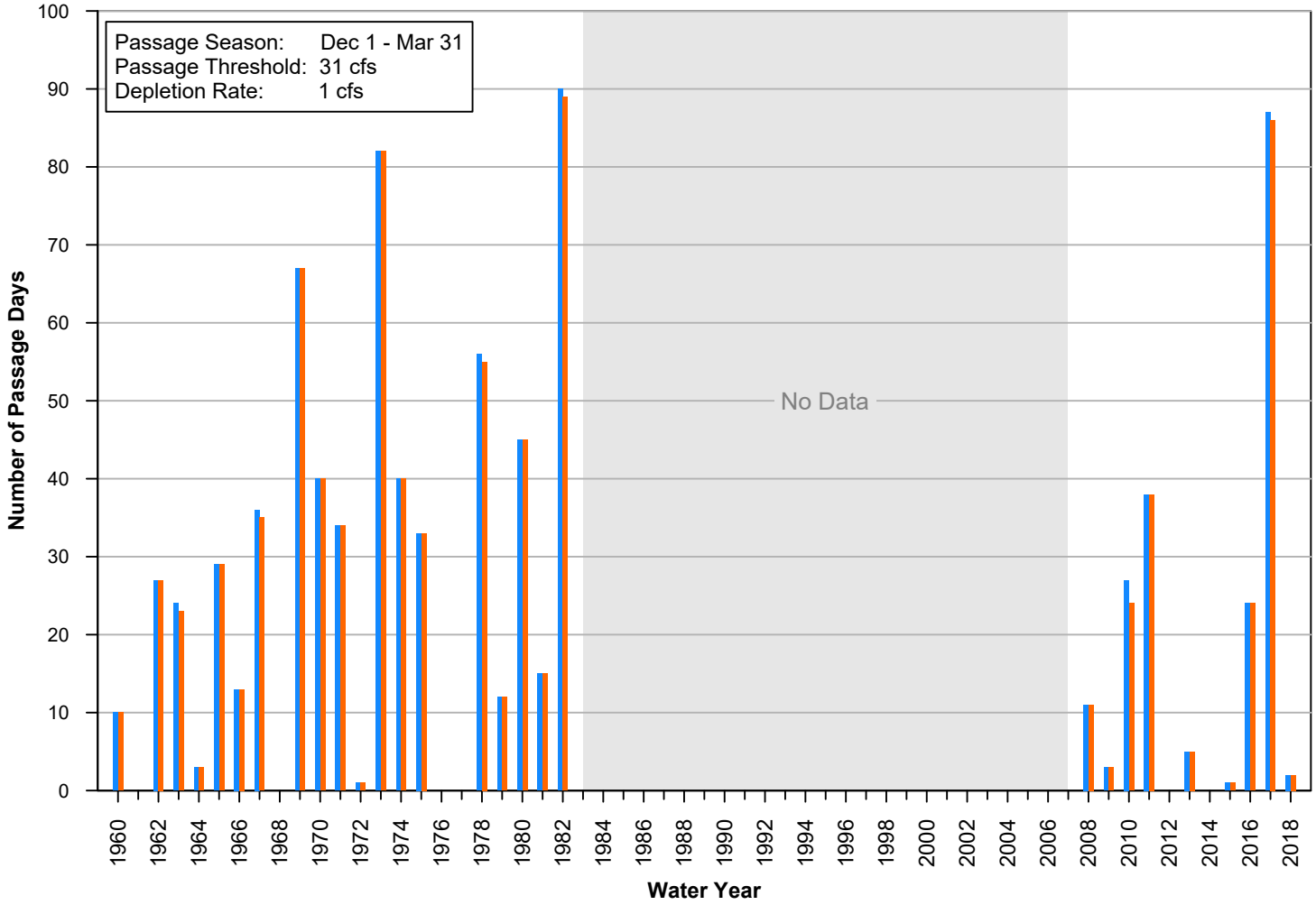
November 2021

TODD GROUNDWATER

Figure 6-12b
Flow Profile along the San Benito River

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure 6-12b Flow Profile along the San Benito River.gpj



Future Baseline

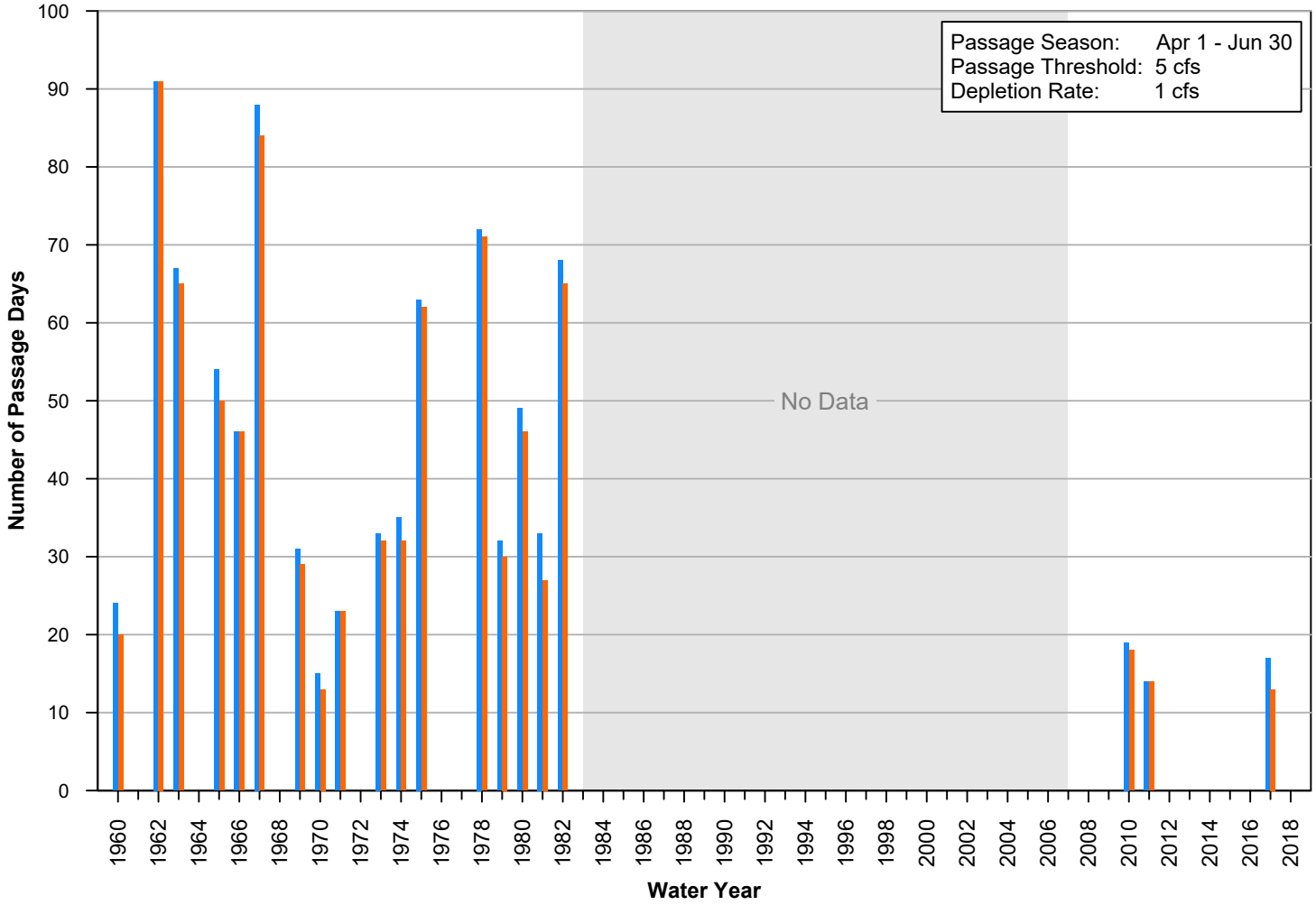
With Pumping Depletion

November 2021

TODD GROUNDWATER

Figure 6-13
Adult Steelhead Passage Opportunity on Pacheco Creek

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure 6-13 Adult Steelhead Passage Opportunity on Pacheco Creek.gpj



Future Baseline

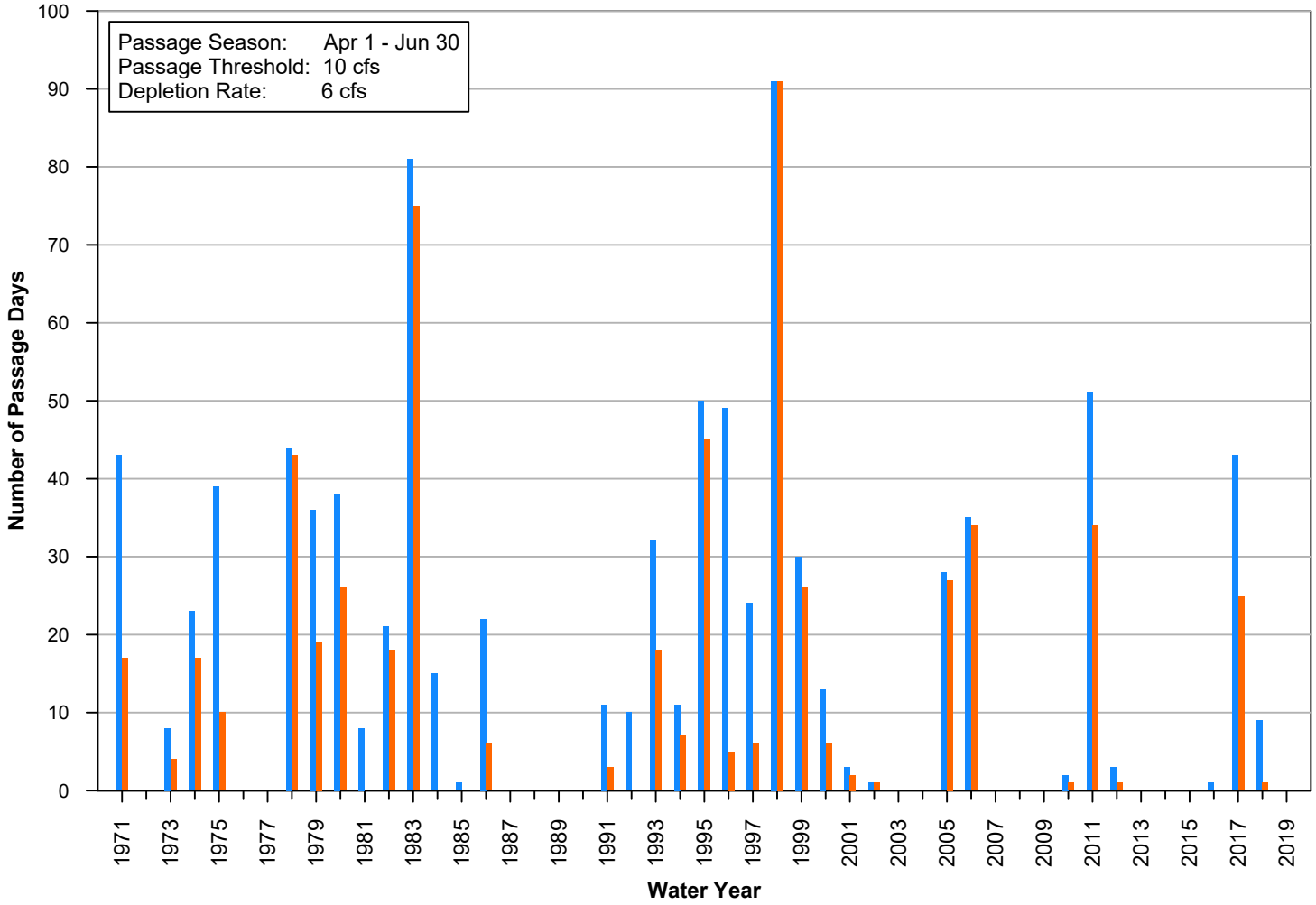
With Pumping Depletion

November 2021

TODD GROUNDWATER

Figure 6-14
Steelhead Smolt Passage Opportunity on Pacheco Creek

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure 6-14 Steelhead Smolt Passage Opportunity on Pacheco Creek.gpj



Future Baseline

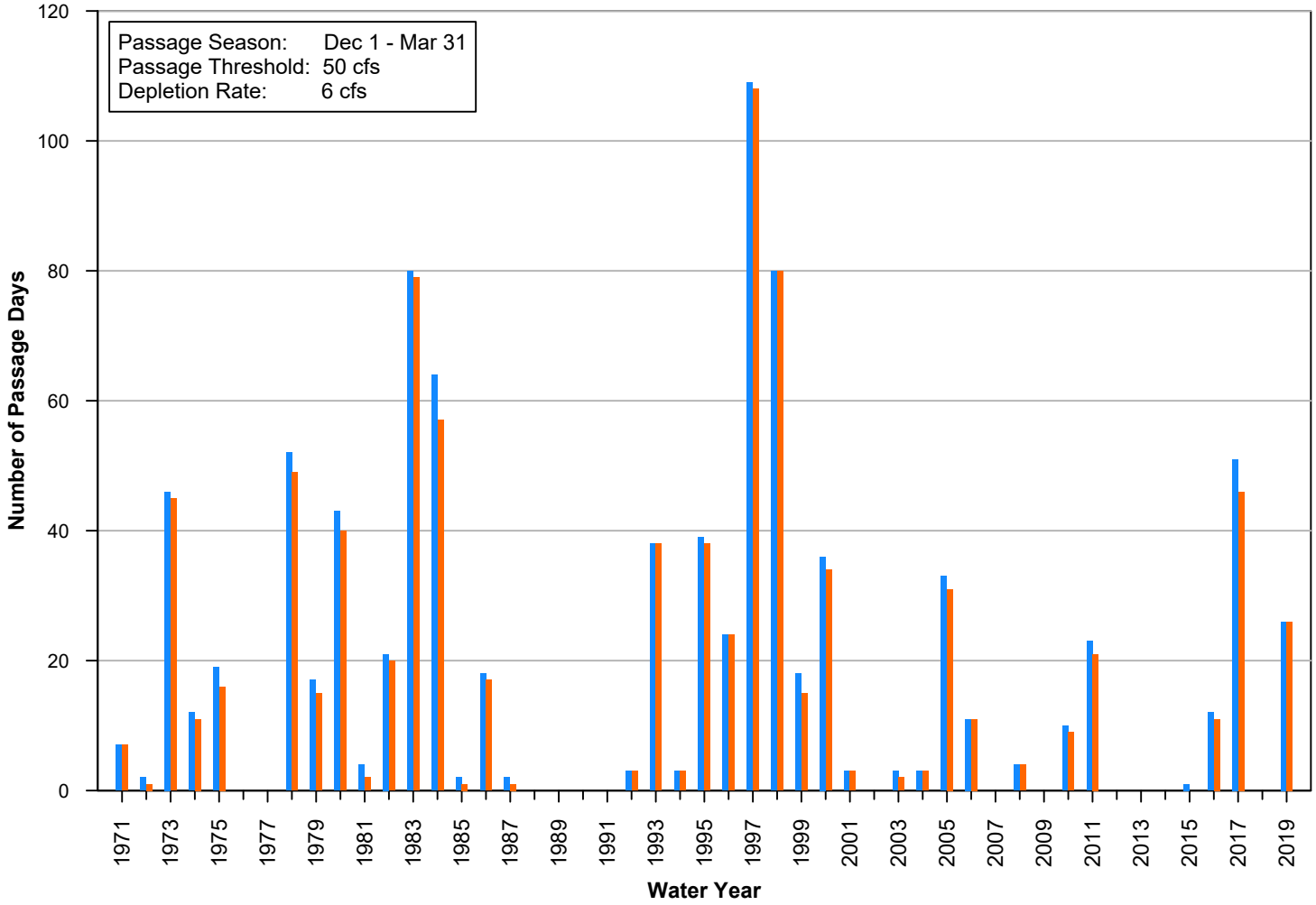
With Pumping Depletion

November 2021

TODD GROUNDWATER

Figure 6-15
Steelhead Smolt Passage Opportunity on San Benito River

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure 6-15 Steelhead Smolt Passage Opportunity on San Benito River.gpj



Future Baseline

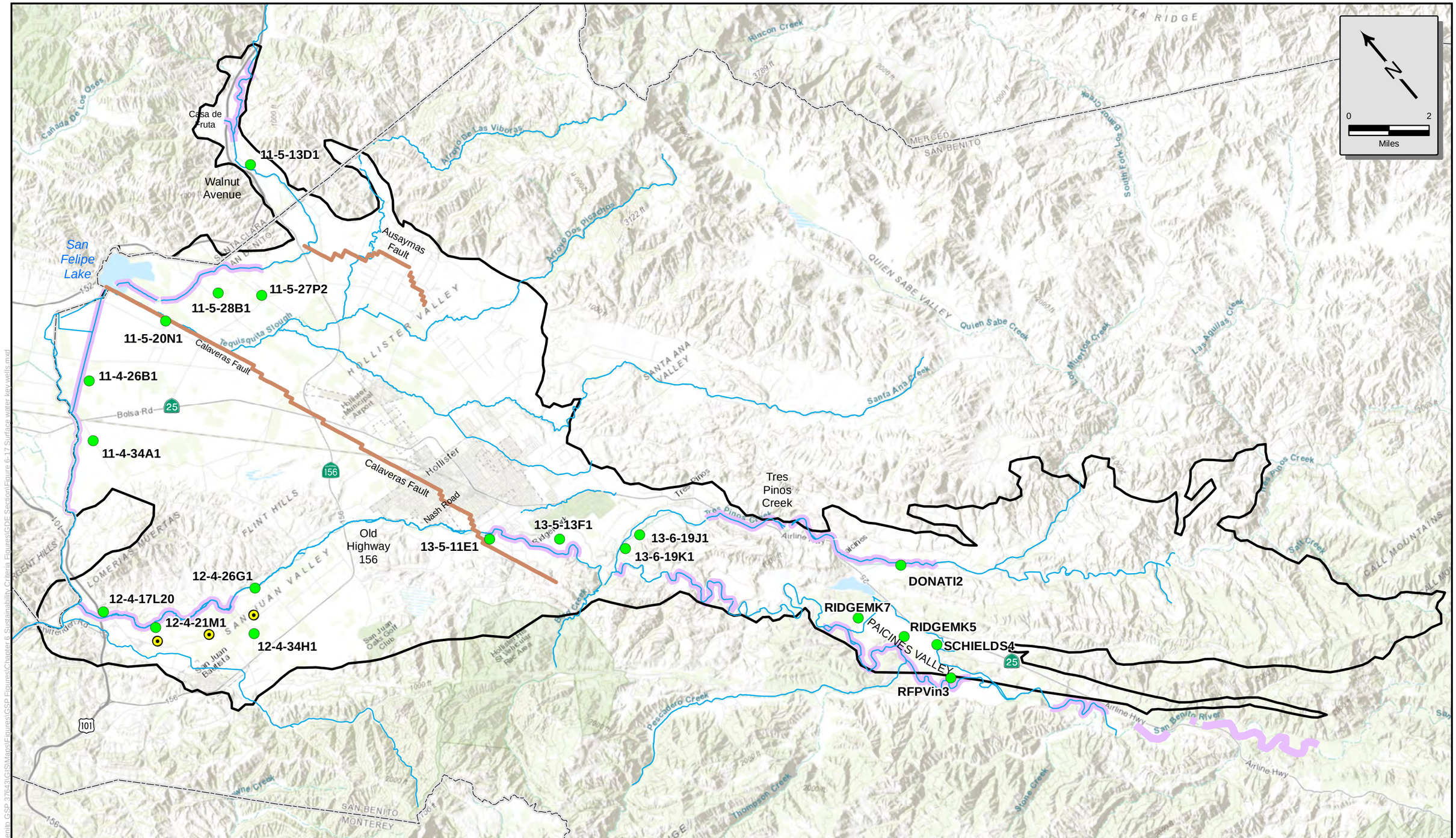
With Pumping Depletion

November 2021

TODD GROUNDWATER

Figure 6-16
Adult Steelhead Passage Opportunity on San Benito River

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure 6-16 Adult Steelhead Passage Opportunity on San Benito River.gpj



Interconnected Surface Water Key Well

Existing Shallow Monitoring Well

Stream Reach Potentially Connected to Groundwater

Major Fault

North San Benito Basin

November 2021

TODD GROUNDWATER

Figure 6-17
Surface Water Key Wells

Path: T:\Projects\San Benito GSP 27643\GIS\Maps\Figures\GSP Figures\Chapter 6 Sustainability Criteria Figures\GDF Section\Figure 6-17 Surface water key wells.mxd

7. MONITORING NETWORK

The overall objective of the monitoring network for this Groundwater Sustainability Plan (GSP) is to yield representative information about water conditions as necessary to guide and evaluate GSP implementation. Specifically, monitoring network objectives are to:

- Build on the existing monitoring network and available data.
- Expand the network to better represent all Management Areas.
- Reduce uncertainty and provide better data to guide management actions, document the water budget, and better understand how the surface water/groundwater system interacts.
- Monitor groundwater conditions relative to sustainability criteria.
- Identify and track potential impacts on groundwater users/uses and better communicate the state of the basin.

With the intent to provide sufficient data for demonstrating short-term, seasonal, and long-term trends in groundwater and related surface conditions, this GSP builds on existing monitoring programs (summarized in Section 2.1.4) that provide historical information and a context for monitoring. These topics also have been addressed in terms of data gaps in the December 2018 Technical Memorandum (TM), "Data to Support GSP Preparation" (in **Appendix E**). Data gaps are addressed in terms of information needed for understanding the basin setting, evaluation of the efficacy of Plan implementation, and the ability to assess whether the Basin is being sustainably managed.

This GSP Section describes the monitoring network as enhanced to fulfill the Sustainable Groundwater Management Act (SGMA) requirements and explains how it will be implemented. This includes description of the monitoring protocols for data collection, the development and maintenance of the data management system (DMS), and the regular assessment and improvement of the monitoring program. This section also summarizes the siting of new dedicated monitoring wells, installed with funding assistance from the Sustainable Groundwater Management Round 3 Grant program (Round 3).

7.1. DESCRIPTION OF MONITORING NETWORK

Table 7-1 provides a summary of the monitoring network, which documents groundwater and related surface conditions as relevant to the sustainability indicators: groundwater levels, storage, land subsidence, water quality, and interconnected surface water[11]. The discussion of change in groundwater storage addresses monitoring for evaluation of the water budget inflows and outflows including climate, land use and cropping, surface water flows, imported water deliveries, reservoir releases for groundwater recharge, wastewater percolation and water recycling, and groundwater pumping.

[11] Seawater intrusion is noted, but no risk of seawater intrusion exists in this inland basin.

Table 7.1-1. North San Benito Monitoring Program Summary

Monitored Variable	Type of Measurement	Locations	Data Interval	Data Collection Agency	Database Storage Agency	Notes
Groundwater levels						
North San Benito Basin	Depth to water, feet	> 100 wells in North San Benito Basin	Quarterly to Semiannual	SBCWD GSA	SBCWD GSA	Measured consistent with data standards and converted to elevations relative to NAVD88
Llagas Subbasin	Depth to water, feet	About 10 wells in Llagas Subbasin	Quarterly to Semiannual	Valley Water GSA	Valley Water GSA	Valley Water GSA data sharing
Groundwater storage						
Rainfall	Rain gauge, daily total, inches	CIMIS Stations # 126, 143	Daily	NCDC with local partners	NCDC	Download from web annually for annual water budget and model update
Reference ET (ET_0)	Daily ETo, inches	CIMIS Stations # 126, 143	Daily	CA DWR, CIMIS program	DWR	Download from web
Stream flow	Daily average flow, cfs	Five active and eight inactive USGS gages	Daily	USGS	USGS	Download from web
Stream flow	Instantaneous flow, cfs	Misc. flow measurements	misc / historical	SBCWD GSA	SBCWD GSA	Map of current and historical locations provided in Annual Reports (e.g., 2018)
CVP deliveries- Agricultural	Metered water deliveries, AF	Zone 6	Monthly	SBCWD GSA	SBCWD GSA	Reported by distribution subsystem; in Annual Reports as acre-feet per year (AFY), compiled by then-defined subbasin areas and Zone 6, to be updated to Management Areas
CVP deliveries- Municipal	Metered water deliveries at WTPs	Lessalt and West Hills WTP,	Monthly	SBCWD GSA	SBCWD GSA	In Annual Reports as AFY; City of Hollister, Sunnyslope County Water District, Stonegate
Reservoir water budgets	Inflows, outflows, observed and computed change in storage	Hernandez, Paicines, San Justo Reservoirs	Monthly	SBCWD GSA	SBCWD GSA	Water year budgets reported in Annual Report, AFY
Reservoir releases-percolation	Reported as acre-feet per month	Hernandez, Paicines Reservoirs	Monthly	SBCWD GSA	SBCWD GSA	Historical annual releases reported in Annual Report, AFY
CVP diversions to percolation	Reported as acre-feet per month	Pacheco, Arroyo de las Viboras, Arroyo Dos Picachos, Santa Ana Ck, Tres Pinos Creek, San, Benito River	Monthly	SBCWD GSA	SBCWD GSA	Annual percolation (AFY) since 1994 reported by stream reach in Annual Reports; percolation since 2017 only to recharge basins adjacent to listed streams
Wastewater pond water budgets	WWTP effluent discharge, evaporation, percolation, AF	Hollister domestic and industrial pond, Ridgemark I and II, Tres Pinos	Monthly	City of Hollister, Sunnyslope County Water District, Tres Pinos County Water District	SBCWD GSA	AFY reported in Annual Report; San Juan Bautista discharges not reported because wastewater exits San Juan MA without recharging
Wastewater percolation	WWTP percolation volume, AF	Hollister domestic and industrial pond, Ridgemark I and II, Tres Pinos	Monthly	City of Hollister, Sunnyslope County Water District, Tres Pinos County Water District	SBCWD GSA	Annual data reported in Annual Report; San Juan Bautista discharges not reported because wastewater exits San Juan MA without recharging; Hollister industrial ponds also percolate stormwater
Recycled water use	Recycled water delivery, AF	Hollister	Monthly	City of Hollister	SBCWD GSA	Annual data, AFY, reported in Annual Report
Crop patterns	Map of crops by field, mid-summer	San Benito Groundwater Basin	Annual	DWR (LandIQ)	DWR	Download shapefile from DWR SGMA Data Portal
Municipal Water Use	Metered water use by sector	City of Hollister, Sunnyslope County Water District, Tres Pinos County Water District, San Juan Bautista	Monthly	City of Hollister, Sunnyslope County Water District, Tres Pinos County Water District, San Juan Bautista	SBCWD GSA	Annual data reported in Annual Report: CVP, groundwater, recycled water use (AFY)
Groundwater pumping						
Agricultural, Zone 6 in Hollister and San Juan MAs	Metered hours of pump operation x average pump discharge	Irrigation wells, Zone 6	Semi-annual	SBCWD GSA	SBCWD GSA	Annual data reported in Annual Report:
Agricultural, Bolsa and Southern MAs	Estimated		Annual	SBCWD GSA	SBCWD GSA	Annual estimates provided in water budget updates of Annual Report
Municipal	Metered monthly total pumping by well	Municipal well locations	Monthly	SBCWD GSA	SBCWD GSA	Request data from cities of Hollister and San Juan Bautista, Sunnyslope County Water District
Community Water Systems	Estimated		Annual	SBCWD GSA	SBCWD GSA	Annual estimates provided in water budget updates of Annual Report
Rural domestic, commercial, industrial	Estimated		Annual	SBCWD GSA	SBCWD GSA	Annual estimates provided in water budget updates of Annual Report
Subsidence						
Subsidence	UNAVCO GPS measurements of ground surface displacement	Eight stations in and around North San Benito Basin	Real time, processed daily	UNAVCO (link on DWR SGMA Data Portal)	UNAVCO	Download annually, update graphs, evaluate for inelastic subsidence, and compare results with Minimum Threshold rate
Subsidence	InSAR satellite mapping of ground displacement	North San Benito Basin	Annual change	DWR (InSAR)	DWR SGMA Data Portal	Download annually, smooth InSAR raster data sets (see Section 6.4.4.6), compare cumulative elevation change since 2015 against Minimum Threshold criterion.
Groundwater quality						
SBCWD Groundwater Quality Monitoring Program	Specific conductance, TDS, N	About 20 wells in North San Benito Basin	Quarterly/ Semi-annual	SBCWD GSA	SBCWD GSA	Additional constituents; Title 22 and boron
Rural ag/domestic wells; community water systems	Specific conductance, N	About 20 wells in North San Benito Basin	Various	ILRP, DDW, RWQCB, USGS, DWR, DPR	SWRCB Geotracker database	Download data every three years from Geotracker as part of Triennial Upate
Interconnected Surface Water and GDEs						
Groundwater levels	Depth to water, feet	Six shallow Round 3 wells	Quarterly	SBCWD GSA	SBCWD GSA	Measured consistent with data standards and converted to elevations relative to NAVD88

The monitoring is described in the following sections relative to the sustainability criteria, including description of the monitoring network with respect to the four Management Areas (MA) and the level of monitoring and analysis appropriate for each MA.

7.1.1. Chronic Lowering of Groundwater Levels

As described in Plan Area Section 2.1.4.1, the San Benito County Water District (SBCWD) has had a groundwater level monitoring program since water year (WY) 1977; the Annual Groundwater Reports provide quarterly groundwater level data for each year in **Appendix F**. The data are the basis for groundwater level contour maps, change maps, hydrographs, groundwater level profiles, and storage change computations, which have been presented to support ongoing groundwater basin management and to fulfill requirements of portions of the San Benito County Water District Act (California Water Code Appendix 70-7.6). Historically, groundwater level monitoring efforts were focused on Zone 6, where SBCWD delivers CVP water and has maintained a relatively intensive monitoring program with additional monitoring in the adjacent Bolsa. The SBCWD monitoring program includes wells in the Pacheco Valley in Santa Clara County and Valley Water (SCVWD) provides data for selected wells in southern Llagas Subbasin which have been used in the SBCWD annual groundwater level maps. SBCWD has provided data to the California Statewide Groundwater Elevation Monitoring (CASGEM) program since 2011.

The groundwater level monitoring network currently is being improved through the following actions:

- In 2018, SBCWD initiated a program (funded by Round 2 and SBCWD cost sharing) to increase the number of existing production wells in the monitoring program. That effort involved mapping and prioritization of unmonitored areas in the Basin, identification of wells with recent access problems, identification of potential wells to add to the program, and digitization of well information. This has resulted in the resurrection or addition of about 20 production wells for monitoring as part of this GSP.
- In 2019, SBCWD developed a systematic approach to add dedicated monitoring wells to the monitoring program. This was submitted to California Department of Water Resources (DWR) as part of the Application for Round 3 Sustainable Groundwater Management Planning grant funds. This application was approved by DWR and the Round 3 work plan was initiated in June 2020.

Potential data gaps in the groundwater level monitoring program are described in the December 2018 TM, “Data to Support GSP Preparation” and listed in Sustainability Criteria Section 6.2.6 along with responsive actions that include continuation of the implementation efforts above. Benefits of these efforts will accrue over the next few years and will support review and update of the monitoring program in the 2027 Five-Year GSP Update.

7.1.1.1. Spatial and Vertical Coverage

Figure 7-1 shows locations of groundwater level Key Wells, new dedicated monitoring wells, and other wells monitored as part of the SBCWD groundwater level monitoring program. Also shown are wells in the adjacent Llagas Subbasin that are monitored by Valley Water (SCVWD) and data shared with SBCWD for North San Benito. **Table 7-1** provides a summary of relevant monitoring programs.

The 22 Key wells for groundwater levels also are listed in **Table 6-1** (Sustainability Criteria Section 6.2.6) with the respective Minimum Thresholds.

The scientific rationale for inclusion of wells in the SBCWD groundwater level monitoring program has involved the following:

- Spatial distribution and density of wells, accounting for variable geographic conditions including topography, hydrology, geologic structures, aquifer characteristics, confined and unconfined conditions, pumping patterns, management activities (including managed aquifer recharge), and potential impacts to beneficial uses/users.
- Length, completeness, and reliability of historical groundwater level record.
- Well depth, with specific information on well construction preferred.
- Regular access to the well for measurements.

Well density has been a consideration in identifying new dedicated monitoring well sites and adding existing wells to the monitoring program. DWR guidance (DWR, 2016a, see BMP, Table 1) generally recommends between one to ten monitoring wells per 100 square miles. The North San Benito program is consistent with this guidance (with an area of about 200 square miles and 2019 monitoring of more than 100 wells). More importantly, the SBCWD monitoring program has been developed to account for the variable spatial factors listed above. Monitoring program improvements as part of the GSP include identification of additional existing wells for monitoring across the entire basin with a focus on adding wells in the Bolsa and Southern MAs.

Data on vertical gradients generally are lacking (except the Nested Well in Hollister MA). As discussed in Hydrogeologic Conceptual Model Section 3.6.1, a single principal aquifer has been identified, comprising the Holocene alluvial sediments. While groundwater in the principal aquifer occurs under both unconfined and confined conditions, no distinct continuous confining layer has been identified. Vertical gradients also have not been distinguished because of the reliance of the monitoring program on production wells, which tend to have long screens. This is a data gap recognized in the Groundwater Model Update and Enhancement Report (**Appendix G**) relative to calibration for vertical hydraulic conductivity in most areas. This data gap (among others) is addressed in the Round 3 work plan with installation of new dedicated monitoring wells (with discrete perforated intervals), including shallow wells.

With regard to the data and reporting standards described in GSP Regulations Section 352.4., wells in the SBCWD groundwater level monitoring program have been selected on the basis of local objectives and the above rationale, with the intent to address GSP requirements for well information (e.g., unique site ID, identified reference point, well completion report if available, etc.) as part of GSP implementation. New dedicated monitoring wells (intended to provide a framework for the monitoring program) will be compliant with GSP Regulations.

It should be noted that identification of sites for new dedicated monitoring wells involves not only consideration of monitoring needs for groundwater levels, but also groundwater quality, potential subsidence, and surface water-groundwater interactions.

7.1.1.2. Monitoring Frequency

SGMA and the CASGEM program require collection of static groundwater elevation measurements at least two times per year to represent seasonal low and seasonal high groundwater conditions. The Annual Groundwater Reports provide quarterly groundwater level data, which is more frequent than required and allows tracking of seasonal and long-term trends.

7.1.2. Reduction of Groundwater in Storage

As described in GSP Section 6.3, groundwater level Minimum Thresholds are used as a proxy metric for groundwater in storage. Accordingly, the monitoring of groundwater levels described above in Section 7.1.1 also pertains to tracking sustainability for groundwater in storage.

In addition, GSP Regulations require annual evaluation and reporting of change in groundwater in storage. As documented in past Annual Groundwater Reports (**Appendix F**), change in groundwater in storage has been calculated annually as the product of groundwater level change (feet), basin area (acres), and storativity. In addition, change in storage has been computed triennially using the water budget equation (inflows-outflows=change in storage).

For the GSP, the updated and expanded numerical model has been used to quantify the water budget and change in storage (see Water Balance Section 5) using available information from the SBCWD Monitoring Program. The numerical model (described in **Appendix G**) fulfills data and reporting standards described in Section §352.4.

As described in Plan Area Section 2.1.4.1 and summarized in **Table 7-1**, the SBCWD Monitoring Program provides information needed to update the water budget and assess annual change in groundwater storage. This program compiles and reviews information on climate (rainfall and evapotranspiration), stream flow, imported CVP water deliveries, reservoir releases and CVP percolation, wastewater percolation and water recycling, and groundwater pumping (municipal and agricultural in Zone 6). Previously, change in the volume of groundwater in storage has also been assessed through water budget evaluations that utilize land use information and water demand rates. Change in groundwater in storage is quantified for each of the four Management Areas (as described in Water Balance Section 5).

The lack of reliable measurements of agricultural pumping is a primary source of uncertainty in estimating change in groundwater in storage. Groundwater pumping in Zone 6 has been evaluated since about 1990 as the product of metered hours of pump operation and average pump discharge, but the accuracy of this method has been questioned because of discrepancies with water budget evaluations (based on land use and water factors) and with numerical modeling. Beyond Zone 6, annual groundwater pumping has been assessed on a triennial basis through land use estimates and water budget evaluations.

7.1.2.1. Spatial Coverage

As indicated in **Table 7-1**, evaluation of change in groundwater in storage involves multiple monitored variables; locations of monitoring are described in the table. **Figure 7-2** shows specific locations of climate stations and stream gage locations; also shown are wastewater percolation sites and CVP percolation ponds.

As noted in the December 2018 Technical Memorandum on Data to Support GSP Preparation in **Appendix E**, only four stream gages are currently operated in the Basin and regular monitoring of surface water flows (including natural percolation along stream channels) has been identified as a data gap. The lack of a stream gage on upper Tres Pinos Creek has been identified as a priority item to extend spatial coverage.

With regard to spatial coverage, groundwater pumping for agriculture in Zone 6 (see Plan Area **Figure 1-2** for extent) historically has been evaluated as the product of metered hours of pump operation and average pump discharge, while agricultural pumping beyond Zone 6 has been assessed through water budget evaluations using available land use information.

This GSP includes evaluation of options for evaluating groundwater pumping systematically throughout the basin. These options include continuation of historical methodologies, implementation of a well metering program to measure groundwater pumping, or application of remote sensing methodologies to evaluate groundwater consumption of various land use types (different crops, land covers) to evaluate groundwater use.

7.1.2.2. Monitoring Frequency

Table 7-1 describes the data interval for the monitored variables the contribute to evaluation of groundwater in storage. Groundwater in storage will be assessed annually using the numerical model, which will be recalibrated during each Five-Year Update.

7.1.3. Subsidence

The Monitoring Program will include review of available data including interferometric synthetic aperture radar (InSAR) and University Navigation Satellite Timing and Ranging System Consortium (UNAVCO), to identify any land subsidence in North San Benito (see **Table 7-1**). As applicable, these data will be used to monitor rate and extent with reference to the Minimum Threshold and Measurable Objective, which are described in Sustainability Criteria Sections 6.4.4 and 6.4.5, respectively. These data represent measurements of ground surface displacement and thus are directly applicable to scientific assessment of potential subsidence. Assuming continued data availability, the Monitoring Program will involve annual download of UNAVCO and InSAR data with annual review for any indications of significant, cumulative inelastic subsidence. The reporting will be consistent with GSP Regulations.

7.1.3.1. Spatial Coverage

Figure 7-3 shows the North San Benito Basin with recent InSAR information from DWR and the location of UNAVCO stations. The UNAVCO and InSAR data provide adequate coverage of the North San Benito Basin including all Management Areas. As described in Groundwater Conditions Section 4.3 and Sustainability Criteria Section 6.4, InSAR data are available for the entire Basin (and beyond). UNAVCO data are available from eight ground stations in and around the Basin. While seven of the eight stations are located around the basin and likely show tectonic movement, one station is in the Bolsa MA and shows small changes that indicate local inelastic subsidence. This UNAVCO data and InSAR data will be cross-checked, and in conjunction with local groundwater level and pumping data, will be used to assess relationships between levels, pumping, and subsidence data.

7.1.3.2. Monitoring Frequency

Assuming continued data availability, the Monitoring Program will involve annual download of UNAVCO and InSAR data with analysis for any signs (rate and extent) of cumulative inelastic subsidence. Generally, subsidence has not been noticed in North San Benito and any rates indicated by UNAVCO monitoring have been small. While data will be reviewed annually, at this time detailed analysis relative to the Minimum Threshold and Measurable Objective is planned as part of the Five-Year Update.

7.1.4. Seawater Intrusion

There is no monitoring for seawater intrusion and no gaging of tidal influence. The NSBGB is located inland from Monterey Bay approximately 20 miles upstream from the mouth of the Pajaro River; lowest elevations (at the confluence of the San Benito River and Pajaro River) are above about 110 feet. No risk of seawater intrusion exists in the Basin given its location and therefore no monitoring is needed.

7.1.5. Degraded Water Quality

In addition to the general monitoring objectives listed above, specific objectives for the GSP water quality monitoring program include the following:

- Collect groundwater quality data from the principal aquifer to identify and track trends of any water quality degradation.
- Map the movement of degraded water quality.
- Define the three-dimensional extent of any existing degraded water quality impact.
- Assess groundwater quality impacts to beneficial uses and users.
- Evaluate whether management activities are contributing to water quality degradation.

The existing water quality monitoring programs for North San Benito Basin are described in Plan Area Section 2.1.4.1, Groundwater Conditions Section 4.4.1, and Sustainability Criteria Section 6.6.4.1. To summarize, the SBCWD Monitoring Program involves at least annual sampling of about 20 wells with lab analysis for general minerals, physical parameters, and selected constituents of concern. As described in Groundwater Conditions Section 4.7 and discussed in depth in Section 6.6 on the water quality sustainability criteria, a broad suite of inorganic constituents is sampled and analyzed and known regulated contamination sites are tracked. Based on understanding of the basin and tracking since 1997, TDS and nitrate have been identified as the key constituents of concern for which sustainability criteria have been defined. As described in Groundwater Conditions Section 4.5, the monitoring and reporting for the Salt and Nutrient Management Plan are conducted as part of SBCWD's water quality monitoring program and triennial update.

In addition to its regular, direct monitoring program, once every three years, SBCWD compiles and reviews all available information on water quality and summarizes it in the Annual Groundwater Report (Todd, 2019). As indicated in the 2019 Annual Groundwater Report, the Triennial Update incorporates all available data from SBCWD, the Regional Water Quality Control Board (regulated facilities and the Irrigated Lands Regulatory Program), California State Water Resources Control Board Division of Drinking Water (DDW), United States Geological Survey (USGS), City of San Juan Bautista, Tres Pinos County Water District, City of Hollister, and Sunnyslope County Water District. This is consistent with DWR guidance to use existing water quality monitoring data to the greatest degree possible.

The GSP monitoring program will continue both the SBCWD Monitoring Program and the Triennial Update. Accordingly, this data set can be used to detect a range of problems quickly, to track trends, allow geochemical investigation, and support focused management actions.

Data from the Triennial Update form the basis for the water quality Minimum Thresholds and Measurable Objectives.

7.1.5.1. Spatial and Vertical Coverage

As described in the Groundwater Conditions Section (see **Figure 4-15)** and summarized in **Table 7-1,** the SBCWD Monitoring Program has historically been focused on the Hollister and San Juan MAs with about 20 wells. Only two wells were monitored as part of the program in Bolsa MA and none in the Southern MA. However, the Triennial Update has involved compilation and review of all water quality data from local and state agencies, and thereby, water quality has been monitored throughout the North San Benito Basin. As documented for the key constituents of TDS and nitrate (see **Table 6-3**), TDS was measured in 213 wells in 2015-2017 and 256 wells were sampled for nitrate in the same years.

For the purposes of this discussion, monitoring of regulated contamination sites is distinguished from monitoring of basin-wide groundwater quality conditions. Monitoring of regulated contamination sites involves dedicated monitoring wells that often are shallow and have documented well construction and sampling depths. These regulated sites are discussed in Groundwater Conditions Section 4.6.1 and locations are shown on Figure **4-17**. While some of these shallow wells could be potentially used for regional monitoring, there are important considerations. For some sites, monitoring wells would have been sited and designed for site-specific problems (e.g., gas stations) that do not necessarily have regional implications. For other sites (e.g., food processing, wastewater disposal, fertilizer handling/storage), the monitoring is potentially pertinent to regional conditions (e.g., if uncontained) and is important to track, but may not be representative of regional conditions or trends.

Figure 7-4 shows the spatial distribution of wells currently in the SBCWD Water Quality Monitoring Program, including the wells historically monitored and new dedicated monitoring wells that will be sampled regularly.

The scientific rationale for selection of wells currently in the SBCWD Water Quality has included:

- Areal distribution of wells across Zone 6, the area for distribution of CVP imported water.
- Location relative to areas with water quality issues; these include natural issues (e.g., siting of the Nested Well addresses native elevated boron) and human-induced activities such as wastewater disposal and general salt loading.
- Length, completeness, and reliability of historical record.
- Regular access to the well for measurements.
- Well depth, with specific information on well construction preferred.

As with the groundwater level monitoring program, existing wells in the SBCWD groundwater quality monitoring program will be evaluated relative to GSP Regulations Section 352.4. requirements for well information. Most do not have sufficient well construction information to identify the zones being monitored and this information will need to be acquired. The new dedicated monitoring wells (part of the Round 3 effort) are designed to meet requirements; these new wells address gaps not only in the water level monitoring program, but also the water quality monitoring program.

Vertical coverage is discussed in Groundwater Conditions Section 4.9, which indicates that the water quality monitoring programs in the Basin do not reveal vertical differences in water quality. The exception is the Nested Well in Hollister MA, a dedicated monitoring well that is part of the SBCWD Program and samples from five depth zones. Otherwise, vertical coverage is a recognized data gap; this reflects the facts that 1) most monitored wells (excluding the contamination site wells mentioned above) are private pumping wells with long screens and 2) well construction information is lacking for most wells.

As stated in Section 6.6, the SBCWD Monitoring Program will be improved and expanded to address spatial and vertical coverage. This will include evaluation of existing wells to add to the SBCWD monitoring program; continued review of data from local agencies and the Irrigated Lands Regulatory Program is likely to reveal candidate wells for inclusion in the SBCWD Program. Additional investigations of nitrate and salt loading may include installation of additional dedicated monitoring wells designed to evaluate loading and vertical migration of salt and nitrate, and these could be added to the Monitoring Program. Lastly, the SBCWD Monitoring Network is enhanced by addition of dedicated monitoring wells as part of the work plan for the Round 3 Sustainable Groundwater Management Planning Grant.

7.1.5.2. Temporal Coverage and Monitoring Frequency

As described in Sections 2.1.4.1 and 6.6.4.1, SBCWD has been monitoring groundwater quality since 1997; the SBCWD Monitoring Program wells generally are sampled semi-annually. This is consistent with objectives to detect problems relatively quickly and to track trends in areas of variability. Semi-annual sampling is consistent with the general guidance provided in the DWR Best Management Practices for Monitoring Networks and Identification of Data Gaps (DWR, December 2016), which suggests sampling at the seasonal high and low (or more frequent as appropriate).

An evaluation of quality data indicates that seasonal fluctuations in concentrations are tracked on a biannual basis with little risk to missed changes in groundwater concentrations. As particular water quality issues are identified in local areas, more frequent monitoring could be instituted for selected wells with the regional sampling program conducted on a biannual basis.

As described in Groundwater Conditions Section 4.6.1, North San Benito Basin does include regulated contamination sites; information is compiled from these sites as part of the Triennial Update. This frequency of SBCWD review has been sufficient to evaluate potential impacts to beneficial uses and users, given that these sites are regulated by State agencies.

7.1.5.3. Monitored Constituents

As described in Section 6.6.4.1, wells in the SBCWD Program generally are sampled semiannually with lab analysis for general minerals, physical parameters, and selected constituents of concern. Sections 4.7 and 4.8 discuss specific analytes including TDS, nitrate, hardness, boron, perchlorate and metals (arsenic, chromium, manganese, and selenium). The selection of key constituents (TDS and nitrate) are based on relevance to important water quality issues (Belitz, 2003).

Noting that TDS represents the sum of various constituents, some of which are a concern, the monitoring program should analyze for all major anions and cations (bicarbonate, chloride, and sulfate; and calcium, magnesium, sodium, and potassium). This is necessary for basic geochemical plotting of water types and verification of analytical accuracy. Analyses should also include boron, given its elevated concentrations in the basin and crop sensitivity issues. Boron may also assist in determining wastewater impacts as would total phosphate (DWR, 1966) and surfactants (measured as methylene blue active substances (MBAS)). Turbidity should be measured by the laboratory on each groundwater sample to assist evaluation of any detections of metals.

7.1.6. Depletion of Interconnected Surface Water

The minimum threshold defined for depletion of interconnected surface water is defined by groundwater levels monitored within one mile of specific stream reaches with shallow groundwater conditions. At this time, wells in the groundwater levels monitoring program are production wells with

relatively deep screens that have not been sited and designed for tracking surface water-groundwater interactions. The lack of shallow monitoring wells has been a data gap.

Improvement of the surface water-groundwater monitoring program includes addition of dedicated near-stream shallow monitoring wells, implemented as part of the Round 3 Sustainable Groundwater Management Planning grant funds from DWR. At time of writing, sites for dedicated shallow groundwater monitoring wells have been identified with planned installation before 2022. Monitoring of these new dedicated wells will begin as soon as possible.

Benefits of the new wells will accrue over the next few years and support characterization of the spatial and temporal exchanges between surface water and groundwater, plus subsequent development of methods to calculate depletions of surface water caused by groundwater extractions, as required by the GSP Regulations §354.34(c)(6), and as planned as part of the 2027 Five-Year GSP Update.

Improvements of the monitoring network will be responsive to GSP Regulations that require characterization of the following:

- Flow conditions including surface water discharge, surface water head, and baseflow contribution.
- Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.
- Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.
- Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.

7.1.6.1. Spatial and Vertical Coverage

Figure 7-5 is a map showing locations of key wells currently selected for monitoring shallow groundwater levels along selected stream reaches. The identification of key stream reaches is described in Sustainability Criteria Section 6.7 and has addressed all management areas. **Table 7-1** provides a summary of the monitoring.

The scientific rationale for inclusion of wells in the shallow groundwater level monitoring program has involved the following:

- Location within one mile of stream reaches where springtime depth to water is typically 20 feet or less and with no separation from the reach by a fault.
- Length, completeness, and reliability of historical groundwater level record with measurements beginning before 1992 (the end-of-drought year specified in definition of the MT).
- Well depth, with specific information on well construction preferred.
- Regular access to the well for measurements.

The currently selected wells are all water supply wells with relatively deep screens and therefore do not provide the needed vertical (shallow) coverage. Accordingly, sites have been selected for installation of new dedicated shallow wells as part of the Round 3 effort. The rationale for selecting these sites includes location close to the selected stream reaches, land availability and accessibility.

As with the regional groundwater level monitoring program (see Section 7.1.1), existing wells in the groundwater monitoring program for shallow groundwater have been evaluated with regard to GSP Regulations Section 352.4. requirements for well information, and data deficiencies (for example, lack of a unique ID) have been noted for improvement during GSP implementation. The new dedicated shallow monitoring wells are designed to fulfill GSP Regulations Section 352.4 standards.

7.1.6.2. Temporal Coverage and Monitoring Frequency

The monitoring for groundwater levels along selected stream reaches will be implemented as part of the overall groundwater level monitoring program as described in Section 7.1.1.2. Monitoring of existing wells in the program will be continued, serving as the Key Wells for monitoring relative to the Minimum Thresholds defined in GSP Sustainability Criteria Section 6.7.6. In the meantime, the periods of record for new dedicated shallow wells will be established. Groundwater level data will be reviewed annually (for each annual report) with reference to the Minimum Threshold. Detailed analyses of the relationships among deep and shallow groundwater level data, stream flow, and riparian conditions will be provided in the Five-Year Update (or sooner if extreme drought conditions and riparian mortality occur; see GSP Section 6.7.7.1).

7.2. Protocols for Data Collection and Monitoring

This section focuses on groundwater level monitoring (including regional and surface water-oriented) and groundwater quality sampling by SBCWD. Other data (e.g., climate, streamflow, municipal pumping, subsidence) are compiled by other agencies.

This section describes general procedures for documenting wells in the monitoring program and for collecting consistent high quality groundwater elevation and groundwater quality data. In general, the methods for establishing location coordinates (and reference point elevations for elevation monitoring) follow the data and reporting standards described in the GSP Regulations (Section 352.4) and the guidelines presented by USGS Groundwater Technical Procedures. These procedures are summarized below.

7.2.1. Field Methods for Monitoring Well Data

Background data for each monitoring well is required for its inclusion in the monitoring program. These data are generally available for wells in the network described on **Table 7-1** and shown on **Figures 7-1, 7-4, and 7-5**. As part of GSP implementation, location and elevation data will be acquired where missing, revised if conditions at a monitored well change, and added when new wells are brought into the program. The methods for acquiring these data follow:

- Location coordinates will be surveyed with a survey grade Global Positioning System (GPS). The coordinates will be in Latitude/Longitude decimal degrees and reference the NAD83 datum.
- Reference point elevations will also be surveyed with a survey grade GPS with elevation accuracy of approximately 0.5 feet. During surveying, the elevations of the reference point and ground surface near the well will be measured to the nearest 0.5 foot. All elevation measurements will reference NAVD88 vertical datum.

7.2.2. Field Methods for Groundwater Elevation Monitoring

Reference points and ground surface elevations will be documented as described above prior to groundwater elevation monitoring in the field. Field methods for collection of depth-to-water measurements are described below:

1. Measurements in all wells will be collected within a three-day window whenever possible.
2. Active production wells should be turned off prior to collecting a depth to water measurement.
3. The standard period of time that a well needs to be off before a static measurement is taken is 48 hours.
4. To verify that the wells are ready for measurement, SBCWD staff will coordinate with well operators and/or owners as necessary.
5. Coordination with well operators/owners should occur approximately four days prior to the expected measurement date.
6. Depth to groundwater measurements are collected by either electric sounding tape (Solinst or Powers type sounders) or by steel tape methods. These depth-to-water measurement, methods are described in DWR's Groundwater Elevation Monitoring Guidelines (DWR, 2010). Depth to groundwater will be measured and reported in feet to at least 0.1 foot.

7.2.3. Field Methods for Groundwater Quality Monitoring

SBCWD's current Quality Assurance Project Plan was reviewed for adequacy of data collection and analysis procedures. As described in the Salt and Nutrient Management Plan for Northern San Benito County (Todd, 2014), wells in the SBCWD water quality monitoring program are sampled for Title 22 general physical properties and inorganics.

Groundwater sampling is conducted by trained professionals from SBCWD. Sampling follows standard monitoring well sampling guidelines such as those presented in the National Field Manual for the Collection of Water-Quality Data (USGS, 2021).

Generally, the wells have been pumped prior to sample collection, or are purged. Purging is conducted until field instruments indicate that water quality parameters (pH, ORP, specific conductance, and temperature) have stabilized and turbidity measurements are below five Nephelometric Turbidity Unit (NTUs). The pumping or purging demonstrate that the sample collected is representative of formation water and not stagnant water in the well casing or well filter pack. For groundwater, field temperature and conductivity are recorded while the well is being purged to ensure that physical parameters have stabilized before collecting a sample. All groundwater samples are collected in laboratory-supplied, pre-labeled containers and include prescribed preservatives.

All field measurements are recorded in a field logbook or worksheets and the sample containers are labeled correctly and recorded on the chain-of-custody form. The applicable chain-of-custody sections are completed and forwarded with the samples to the laboratory. Upon receipt of the samples at the laboratory, laboratory personnel complete the chain-of-custody. QA/QC assessment of field sampling includes use of field blanks. Field blanks identify sample contamination that is associated with the field environment and sample handling. These samples are prepared in the field by filling the appropriate sample containers with the distilled water used for cleaning and decontamination of all field equipment. One field blank per sampling event is collected.

Samples are sent to a State-certified laboratory that has a documented analytical QA/QC program including procedures to reduce variability and errors, identify and correct measurement problems, and provide a statistical measure of data quality. The laboratory conducts all QA/QC procedures in accordance with its QA/QC program. All QA/QC data are reported in the laboratory analytical report, including: the method, equipment, and analytical detection limits, the recovery rates, an explanation for any recovery rate that is less than 80 percent, the results of equipment and method blanks, the results of spiked and surrogate samples, the frequency of quality control analysis, and the name of the person(s) performing the analyses. Sample results are reported unadjusted for blank results or spike recovery.

7.3. Representative Monitoring

SBCWD has had a groundwater level monitoring program since 1977 and a comprehensive water quality monitoring program since 2004. To allow quantification and tracking of sustainability criteria, representative monitoring sites, or key wells, have been identified for 1) regional groundwater level monitoring and 2) for monitoring shallow groundwater conditions where surface water-groundwater connection is likely and tied to Groundwater dependent ecosystems (GDEs). These key wells are shown on **Figures 7-1** and **7-5**, respectively. These have been designated by SBCWD as the point at which sustainability indicators are monitored. Information on the quantitative values for minimum thresholds, measurable objectives, and interim milestones is included in Sustainability Criteria Sections 6.2 and 6.7, respectively.

As discussed in Sustainability Criteria Section 6.3, change in groundwater in storage is closely related to groundwater levels, which can serve as a proxy for monitoring change in storage. Moreover, groundwater level MTs and MOs are sufficiently protective to ensure prevention of significant and unreasonable results relating to storage. Accordingly, monitoring of the key wells for groundwater levels also serve to track sustainability for storage.

As discussed in Section 6.4, the definition of undesirable results and the quantification of the MT and MO are based on InSAR and UNAVCO information on vertical displacement of the ground surface; these spatial and temporal data are provided by DWR on its website.

Section 6.5 discusses seawater intrusion, which is not possible in this inland basin.

Section 6.6 describes undesirable results, outlines the SBCWD Water Quality Monitoring Program and the Triennial Update, and defines sustainability criteria for water quality. As described in Section 6.6.5, water quality MTs and MOs are defined relative to the numerous data points compiled for the Triennial Update, which includes multiple data sources including but not limited to the SBCWD Water Quality Monitoring Program. MTs and MOs are quantified in terms of the percentage of wells with concentrations exceeding the selected water quality goal for nitrate and Total Dissolved Solids (TDS) based on current conditions (2015-2017).

While not serving as stand-alone representative sites for definition of water quality MTs and MOs, the SBCWD Water Quality Monitoring Program wells shown in **Figure 7-4** are sampled regularly to identify water quality problems and to track water quality trends.

7.4. Data Management System (DMS)

SBCWD has been collecting and compiling groundwater data annually including water levels, water quality, and water use for the Annual Groundwater Report. These data and data from Valley Water (SCVWD) and other sources are being compiled in relational databases, which consists of an Access database, GIS geodatabase, and Excel workbooks and has capabilities for queries to quickly check and summarize data. As part of the GSP, the data management system has been redesigned to be practicable, usable, intuitive, and cost effective. **Appendix E** includes a technical memorandum that describes the final DMS. The relational database includes easy to update tables and reports that assist in comparison of real time conditions and sustainability goals. As described in Section 7.1.6 of the December 2018 TM, "Data to Support GSP Preparation," the District will develop an ID system for wells and will cross reference wells with water level data, water quality data, and wells logs (**Appendix E**).

7.5. Assessment and Improvement of Monitoring Network

SBCWD has actively engaged in assessment and improvement of its monitoring network. This process has been intensified as part of the GSP, given the need to identify data gaps and to assess uncertainty in setting and tracking sustainability criteria. Monitoring improvements are a major part of GSP implementation and will be reviewed and updated for each five-year assessment.

7.5.1. Identification and Description of Data Gaps

Data gaps are identified in **Table 7-2** according to major monitored variable and described in terms of insufficient number of monitoring sites and utilization of monitoring sites that are unreliable (including those that do not satisfy minimum standards). Access issues also are indicated as the cause of insufficient frequency of monitoring, in other words when issues with access to private wells prevent scheduled level monitoring or sampling and cause an interruption in the historical record. Data gaps also are described in terms of the location and reason for data gaps in the monitoring network, and local issues and circumstances that limit or prevent monitoring. Data gaps listed in **Table 7-2** do not include gaps in understanding, which build on the monitoring network but also require investigation and analysis, for example, a focused investigation of salt and nitrate loading to shallow groundwater. These planned studies are described as Management Actions in GSP Section 9.

Table 7-2. Identification and Description of Data Gaps

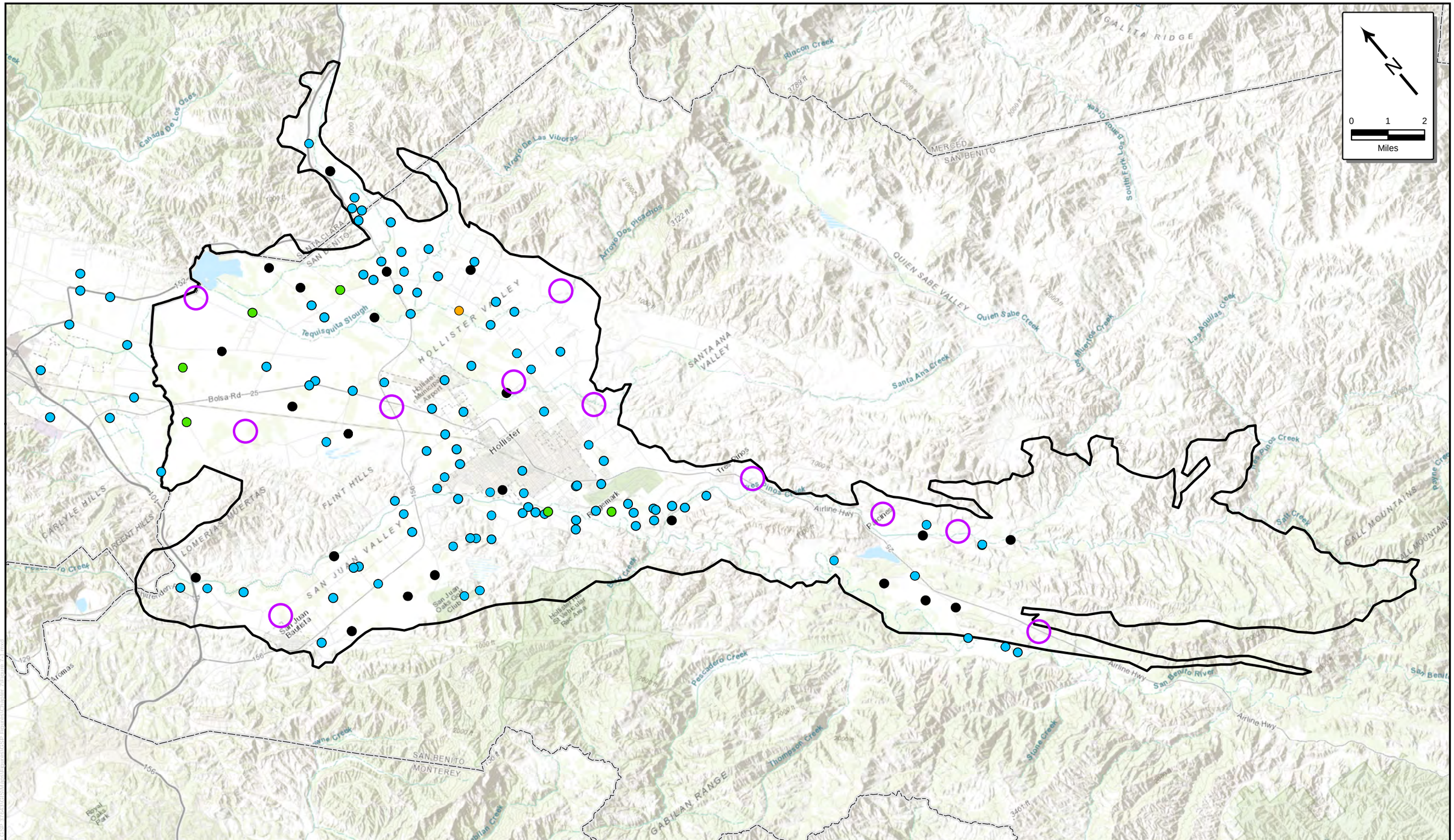
Monitored Variable	Insufficient Sites	Unreliable Sites	Access Issues	Location	Local Issues
Regional Groundwater levels	√	√	√	The network has focused on Zone 6 and relied on private production wells. Insufficient dedicated monitoring wells exist, especially in Bolsa and Southern MAs. Insufficient data exist on vertical gradients.	The network has relied on private production wells, many lacking well construction information. Other wells lack a unique ID, do not have an accurate reference point, and/or have access issues. Need for basin-wide funding.
Stream flow	√			Only five active gages; gage lacking on Upper Tres Pinos Creek	Cost of installing, maintaining gages
Groundwater extraction	√	√	√	Current power metering method is limited to Zone 6; need for consistent method for entire basin	Need for basin-wide funding and implementation of single, consistent method
Groundwater quality	√	√	√	Insufficient dedicated monitoring wells exist, especially in Bolsa and Southern MAs; insufficient data on vertical variations.	Network has relied on private production wells, many lacking well construction information, a unique ID, and have access issues. Additional analytes needed.
Shallow groundwater levels	√			Shallow groundwater monitoring wells lacking along stream reaches with potential surface water-groundwater connection.	

7.5.2. Description of Steps to Fill Data Gaps

As a matter of context, improvement of the groundwater monitoring network has included the SBCWD program initiated in 2018 to map and prioritize unmonitored areas in the Basin, identify wells with recent access problems, identify potential wells to add to the program and digitize well information. It also has included the siting, design, and installation of dedicated monitoring wells as part of the Round 3 work plan initiated in June 2020.

Steps to improve the monitoring program and fill data gaps include:

1. Develop and implement basin-wide funding mechanism to support monitoring throughout the MAs.
    - Support ongoing monitoring of regional groundwater levels and quality including shallow groundwater along selected stream reaches, monitoring associated with managed aquifer recharge, and surface water monitoring (SBCWD miscellaneous measurements and installation of additional stream gages).
    - Support evaluation of groundwater extractions consistently throughout the basin.
2. Improve the well inventory as part of the DMS.
    - Develop and implement a program to provide unique well identification beginning with monitored wells. This would allow discontinued use of well names as identifiers and would comply with data and reporting standards described in GSP Regulations Section 352.4. For all monitored wells, document well information (e.g., unique site identifier, identified reference point, well completion report if available, etc.) in a GIS-linked database; this is a priority task for GSP implementation.
    - Document private well locations and construction information and compile into a well inventory database; this will increase knowledge of private wells that potentially could be affected by regional groundwater level or water quality changes. This documentation can be developed incrementally beginning with more recently drilled private wells and/or a focus on data gap areas.
    - Enhance the DMS with cross-referencing of monitoring sites (groundwater and surface water) relative to location and monitoring for regional groundwater level, groundwater quality, shallow groundwater, subsidence, or managed aquifer recharge.
3. Revise the SBCWD water quality sampling program to provide regular analysis of all major anions and cations to allow basic geochemical evaluation and verification of analytical accuracy. Also consider including boron, total phosphate, surfactants (MBAS), and turbidity.
4. Continue to evaluate wells included in the SBCWD monitoring network and programs (levels and quality). This would include potential discontinuation of wells with inadequate documentation or problematic access, and wells that are deemed unnecessary, and it would include addition/installation of monitoring sites as needs are identified. This is an ongoing, adaptive effort.

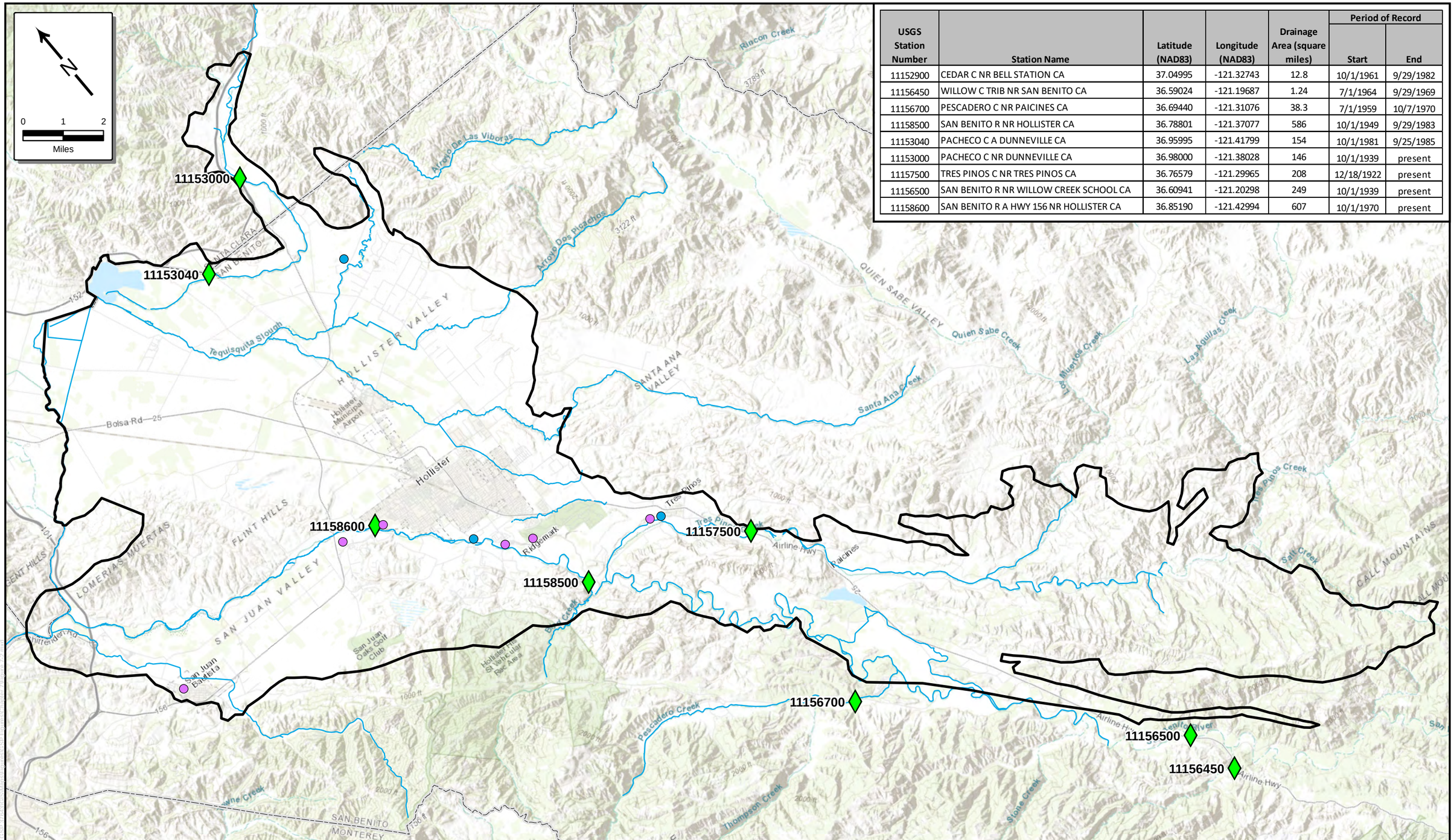


Groundwater Level Key Well
Interconnected Surface Water Key Well
Recently Monitored Wells
Nested Well
Proposed Round 3 Deep Monitoring Well
North San Benito Basin

November 2021

TODD GROUNDWATER

Figure 7-1
Groundwater Level Key Wells, Dedicated and Other Monitoring Wells



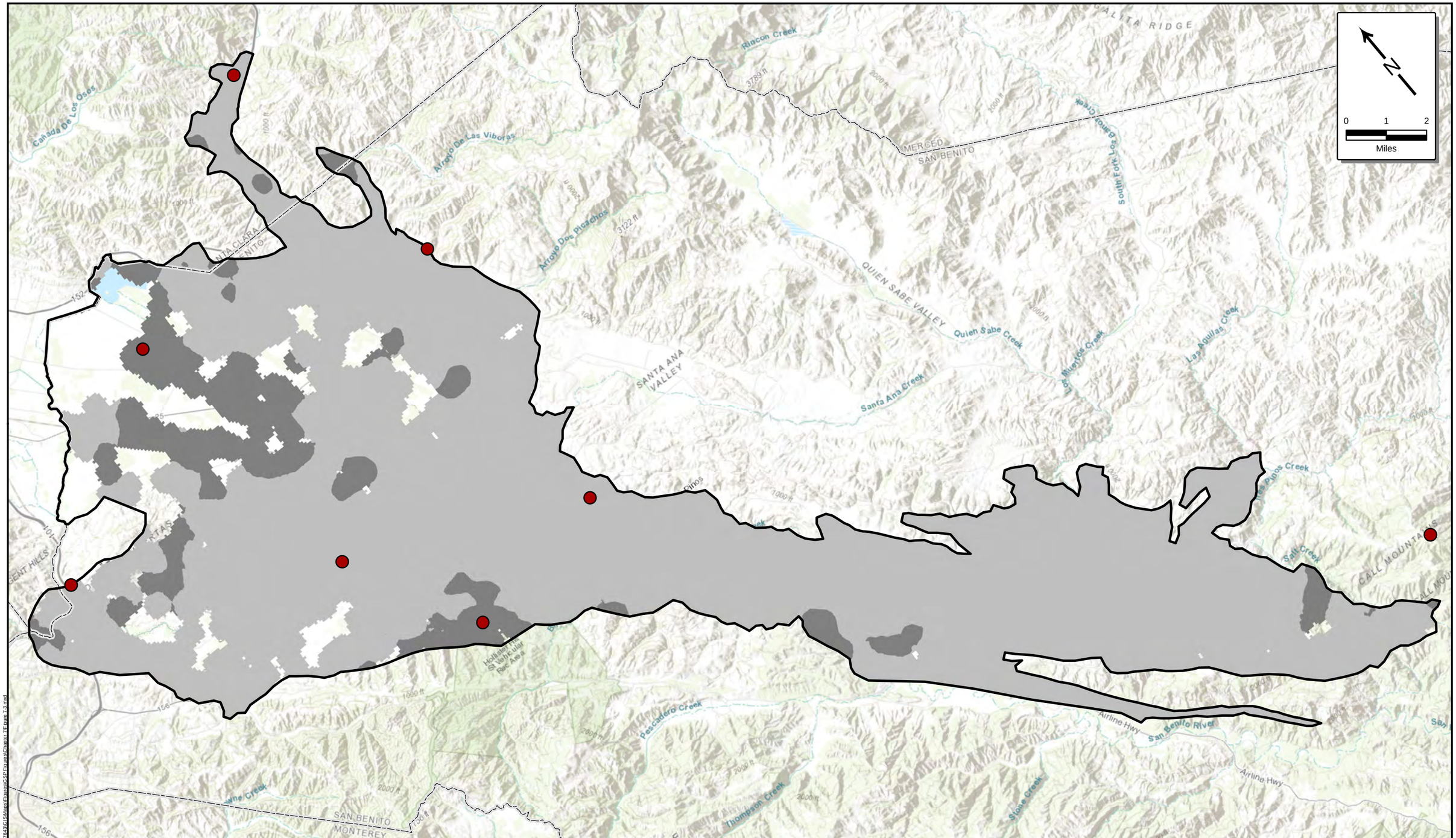
USGS Station Number	Station Name	Latitude (NAD83)	Longitude (NAD83)	Drainage Area (square miles)	Period of Record	
					Start	End
11152900	CEDAR C NR BELL STATION CA	37.04995	-121.32743	12.8	10/1/1961	9/29/1982
11156450	WILLOW C TRIB NR SAN BENITO CA	36.59024	-121.19687	1.24	7/1/1964	9/29/1969
11156700	PESCADERO C NR PAICINES CA	36.69440	-121.31076	38.3	7/1/1959	10/7/1970
11158500	SAN BENITO R NR HOLLISTER CA	36.78801	-121.37077	586	10/1/1949	9/29/1983
11153040	PACHECO C A DUNNEVILLE CA	36.95995	-121.41799	154	10/1/1981	9/25/1985
11153000	PACHECO C NR DUNNEVILLE CA	36.98000	-121.38028	146	10/1/1939	present
11157500	TRES PINOS C NR TRES PINOS CA	36.76579	-121.29965	208	12/18/1922	present
11156500	SAN BENITO R NR WILLOW CREEK SCHOOL CA	36.60941	-121.20298	249	10/1/1939	present
11158600	SAN BENITO R A HWY 156 NR HOLLISTER CA	36.85190	-121.42994	607	10/1/1970	present

Stream Gauges in Basin
Recharge Ponds
Wastewater Treatment Plant Recharge
Stream
North San Benito Basin
San Benito County

November 2021

TODD GROUNDWATER

Figure 7-2
Hydrology Monitoring Locations



UNAVCO Stations

North San Benito Basin

San Benito County

Vertical Displacement (inches)

-2 - 0 inches

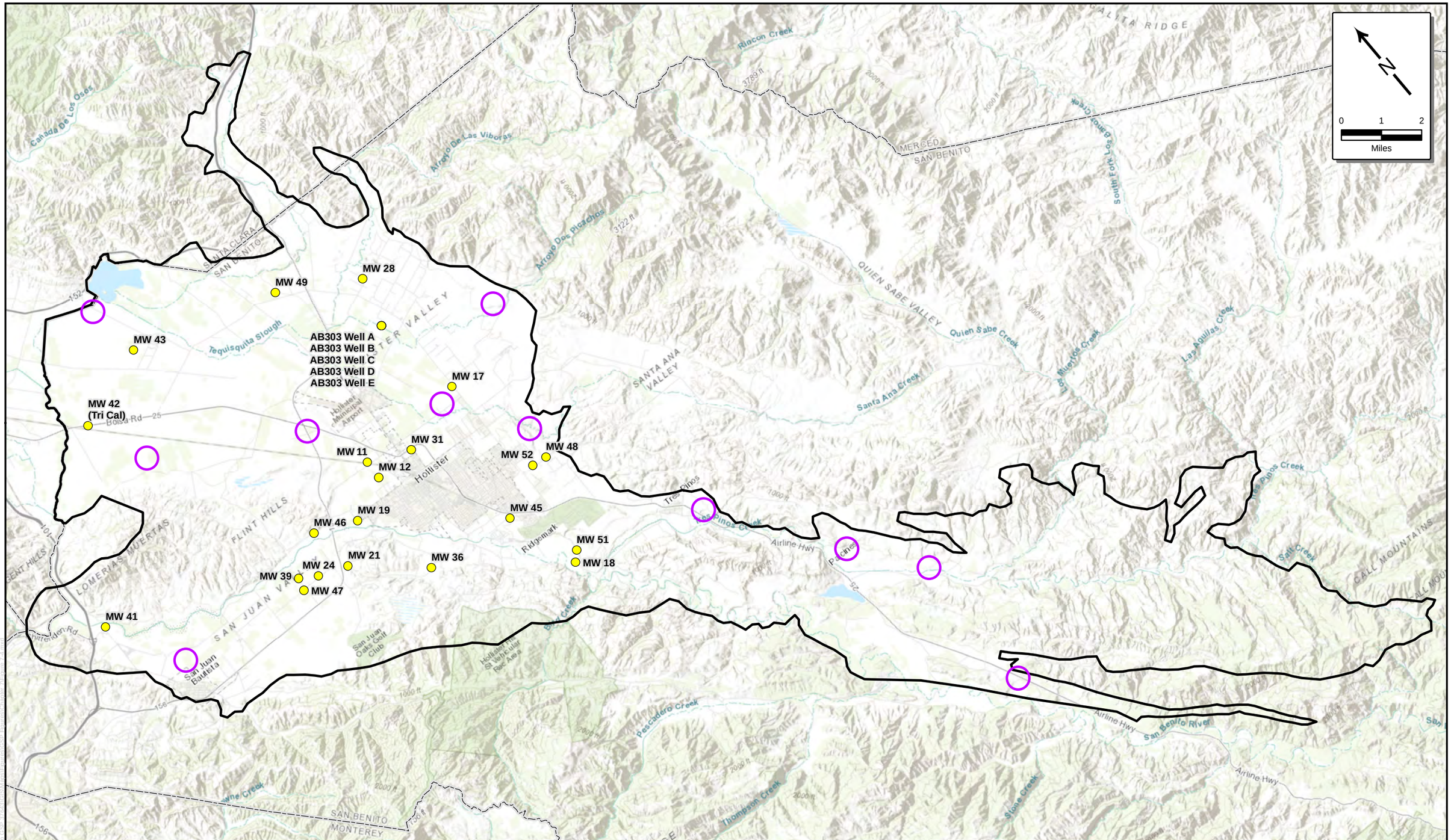
0 - 2 inches

Note:
Vertical displacement data from California Department of Water Resources measured between 6/13/2015 and 9/19/2019 (Tre/Altamira).

November 2021

TODD GROUNDWATER

Figure 7-3
InSAR Ground Surface Elevation Monitoring and Unavco Station Locations



Water Quality Monitoring Well

Proposed Round 3 Deep Monitoring Well

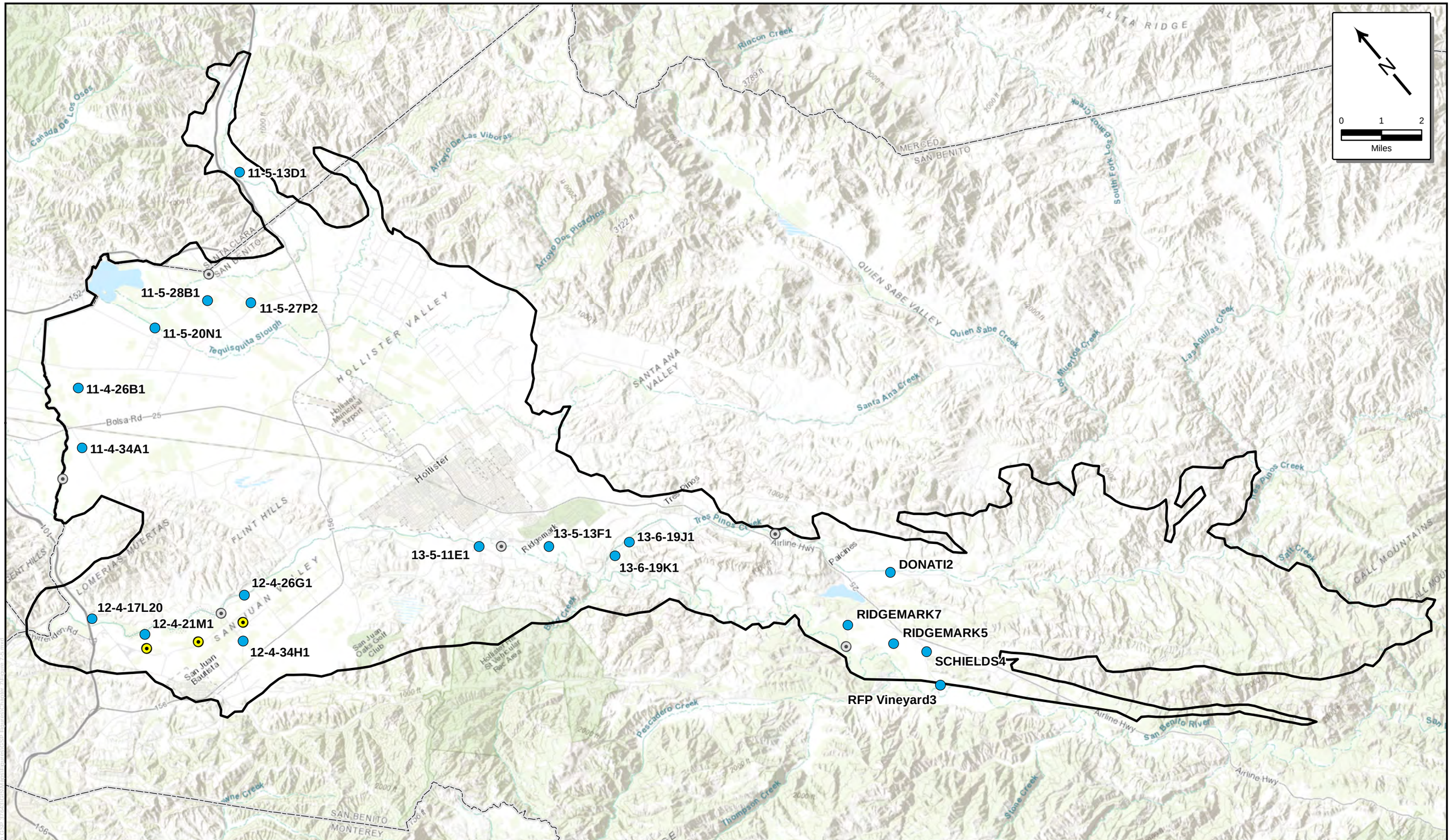
North San Benito Basin

San Benito County

November 2021

TODD GROUNDWATER

Figure 7-4
Wells in the SBCWD Water Quality Monitoring Program



Interconnected Surface Water Key Well
Existing Shallow Monitoring Well
New Shallow Interconnected Surface Water Monitoring Wells
North San Benito Basin
San Benito County

November 2021

TODD GROUNDWATER

Figure 7-5
Surface Water Key Well Locations

8. PROJECTS AND MANAGEMENT ACTIONS

Groundwater conditions in North San Benito Basin are sustainable. However, long-term sustainability requires continuation of monitoring, reporting, and management actions that are adaptive to changing climatic, water supply, and water demand conditions. This section describes numerical modeling forecasting scenarios, building on the future baseline scenario with climate change and with growth, and then presents ongoing, new, and recommended projects and management actions needed to maintain sustainability.

8.1. SIMULATION OF FUTURE CONDITIONS WITH CLIMATE CHANGE AND GROWTH

Future baseline conditions have been simulated using the numerical model as described in Section 5, Water Balance. That baseline simulation reflects a continuation of current conditions into the future and indicates that sustainability will be maintained as represented in a water budget (recognizing that undesirable results also must be addressed). Simulation of the effects of projected climate change and future growth are described here as context for the projects and management actions described below. Future growth includes urban growth and some expansion of vineyard acreage, as described in Section 8.1.2.

8.1.1. Climate Change

Climate change will affect local hydrology and Central Valley Project (CVP) water availability. The climate change scenario assumed land use and water use patterns were the same as in the future baseline scenario. Adjustments to the rainfall and reference evapotranspiration (ETo) time series for the rainfall-runoff-recharge model were made using data sets provided by the California Department of Water Resources (DWR). Those consist of statewide grids of four-by-four-kilometer cells, each with monthly time series of multipliers for precipitation and ETo that can be applied to historical data to estimate future conditions. DWR produced multipliers representing climatic conditions for 2030 and 2070. For this Groundwater Sustainability Plan (GSP), the 2070 data set was selected to fully reveal anticipated climate-change effects. Sixty-two of the grid cells overlapped the watershed area tributary to the groundwater basin. Analysis polygons from the rainfall-runoff-recharge model were assigned to the nearest grid cell, and the corresponding monthly multipliers for precipitation and ETo were applied.

DWR also produced monthly stream flow multipliers at a basin scale, with a single time series of values for the entire watershed area tributary to the model. Those multipliers were applied only to the Pacheco Creek and San Benito River inflows because the simulated inflows for other streams entering the basin already reflected climate change effects through the precipitation and ETo adjustments in the rainfall-runoff-recharge model.

The general result of climate change indicated by the precipitation and ETo multipliers is that the climate in 2070 will be warmer and wetter than the current climate. Precipitation and rainfall recharge are expected to increase in winter, and crop water demand—and hence groundwater pumping for irrigation—are expected to increase in summer. **Figure 8-1** shows the changes in annual rainfall recharge

and groundwater pumping for irrigation for each management area under baseline and climate change conditions. In all management areas, rainfall recharge was considerably higher in wet years under climate change, but about the same as under historical conditions in dry and normal years. In contrast, pumping was greater by a fairly uniform amount in all years. In management areas without CVP water (Southern and Bolsa), irrigation pumping was only slightly higher under climate change conditions. The increase was larger in Hollister and San Juan because CVP imports were reduced by climate change, which necessitated even greater reliance on groundwater.

Table 8-1 shows average annual water balances for the 50-year future analysis period for each management area. In addition to the changes in rainfall recharge and irrigation pumping noted above, subsurface bedrock inflow from tributary watersheds was consistently slightly higher in the climate change scenario than the baseline scenario due to increased rainfall recharge combined with negligible irrigation pumping in the watersheds. In most management areas, percolation from streams increased and groundwater discharge to streams decreased under climate-change conditions, partly due to increased surface water inflow but primarily due to increased groundwater pumping for irrigation. Municipal groundwater pumping was the same under 2070 climatic conditions except in the Hollister Management Area (MA), where it increased due to climate-related reductions in CVP availability.

Hydrographs of simulated groundwater levels for the future baseline and future climate change scenarios are compared in **Figure 8-2**. The hydrographs cover the entire 1922-2007 simulation period. Historical water levels for the corresponding dates are shown simply to compare future water levels with the range of historical conditions (these are not calibration simulations intended to simulate historical water levels). Minimum thresholds are shown for reference. Several geographic patterns can be seen in the results.

In the Southern MA, climate-change water levels in winter were sometimes 2-5 feet higher than future baseline water levels due to increased flow and stream recharge along the San Benito River and Tres Pinos Creek (see hydrographs Donati 2 and Ridgemark 7). Summer water levels were usually 2-5 feet lower than future baseline water levels due to increased irrigation pumping. There was little change in cumulative water-level decline during droughts.

Several patterns are evident in different parts of the Hollister MA. At the southern end, water levels near Tres Pinos Creek and the San Benito River were higher under climate change conditions than under future baseline conditions at times when increased stream recharge more than offset increased irrigation pumping (see hydrograph 13-6-19K1). Throughout the central part of the Hollister MA, the climate-change water levels dropped below the future baseline levels by up to 20 feet during the simulated 1922-1935 drought, remained about that much lower until the mid-1990s, then recovered most or all of the way to baseline levels by 2007 (see hydrographs 12-5-24N1 and 12-6-6L4). This probably reflects the combined effects of local recharge, CVP availability and irrigation pumping simulated for 1922-1935 drought conditions and the wet period in the late 1990s. In Pacheco Creek Valley at the northern end of the Hollister MA, simulated water levels for both scenarios were nearly identical (see hydrograph 11-5-13D1).

Water level patterns in the San Juan MA were similar to those in the central part of the Hollister MA. That is, climate-change water levels dropped to 10-20 feet below the future baseline water levels during 1922-1935 drought conditions and remained that low until the sequence of wet years in the 1990s (see hydrographs 12-4-26G1, 12-5-30H1 and 13-5-11E1).

In the Bolsa MA east of the Calaveras Fault, water levels were usually 5-10 feet lower in summer under climate change conditions but similar to future baseline water levels in winter (see hydrograph 11-5-28B1). In the Bolsa area west of the Calaveras Fault, simulated water levels for the baseline and climate change scenarios fell below the bottom of model layer 1 early in the simulation, causing the layer 1 cells to go dry. This was accompanied by a shift from unconfined to confined conditions, which resulted in a much larger amplitude of seasonal water-level fluctuations. In reality, the system would likely continue to show some water-table response to pumping, with more moderate seasonal fluctuations. The general result of climate change was lower water levels in summer and water levels about the same as (sometimes higher than) future baseline water levels in winter. No long-term trend was apparent (see hydrograph 12-5-17D1).

Cumulative storage change over the 86-year simulation is shown for each management area under baseline, future growth, and future climate change conditions in **Figure 8-3**. The warmer and wetter climate led to a long-term increase in storage in the Southern MA because there is relatively little cropland assumed and additional rainfall recharge was not fully offset by increased irrigation pumping. Additional San Benito River inflow and percolation also helped boost the long-term storage trend. It is likely that increased rainfall would shift some grasslands toward deeper-rooted shrubby vegetation, which would intercept and consume some of the additional recharge calculated for this scenario. In the Hollister MA, climate change resulted in lower groundwater storage throughout the simulation, but not an obvious declining trend. Increased irrigation demand offset the increase in rainfall recharge, and decreased CVP availability shifted some irrigation supply to groundwater. A similar pattern occurred in the San Juan MA. Although there was an increase in net percolation from the San Benito River, it offset only about half of the increase in irrigation pumping. In the Bolsa MA, groundwater storage was lower throughout the simulation but without a long-term declining trend.

In summary, there were no long-term water-level or storage trends associated with the climate change scenario. The projected shift in local hydrology toward wetter and warmer conditions increased simulated pumping and water-level declines in summer and during most droughts, but increased stream inflow and net percolation generally offset those declines. In the most impacted area—the central part of Hollister MA—simulated water levels remained lower by up to 20 feet for decades before an exceptionally wet period provided enough recharge to recover back to baseline water levels. CVP supplies under 2070 climate conditions are expected to be consistently less than under future baseline conditions because of a loss of snowpack in the CVP source areas. In the simulation, this caused further increases in agricultural pumping in the Hollister and San Juan MAs relative to the Southern and Bolsa MAs and accentuated drawdown in summer and during most droughts.

8.1.2. Future Growth

Anticipated future changes in land use include urban growth and some expansion of vineyard acreage. The projected 2068 land use, developed with input from the Technical Advisory Committee (TAC), assumed for the simulation is shown in **Figure 8-4**. The future growth scenario simulated 2068 land use throughout the 86-year hydrologic period used for future simulations. It did not phase in land use changes over the course of the simulation. This is the best way to demonstrate whether 2068 assumed land use is sustainable because 1) it avoids subjective decisions about the concurrent timing of droughts and development, and 2) provides time for the full effect of 2068 land use on groundwater conditions to become apparent.

Urbanization was implemented in the model by converting selected recharge analysis polygons from natural vegetation or agricultural use to urban use. The selection of recharge zones to convert was based on the following practical considerations:

- Development has reached "buildout" conditions by 2068. Buildout water use in the Hollister Urban Area (HUA) has been estimated at 20,148 AFY, or roughly double the current use (HDR, 2008).
- The newly urbanized polygons in and near Hollister increased the total urban area from 5,114 acres in 2014 to 8,962 acres in 2068. This increase of 75 percent is slightly less than the increase in population and water use based on an assumption that future development will be somewhat denser on average than the existing urban area.
- Infill development was prioritized.
- Where reasonable, urbanization was on recharge zones that were non-irrigated in 2014 (natural grassland, idle, and grain). This creates a worst-case scenario in terms of the overall increase in consumptive use of groundwater. Only 238 of the 3,848 acres converted to urban categories were irrigated in 2014.
- San Juan Oaks and the Vintage project were specifically included. Other areas of urban expansion were east of Fairview (south of Santa Ana Road), along McCloskey Road and in the Union Road area west of the San Benito River. This last area is somewhat developed already but is shown as "agricultural" in the 2035 County General Plan. A few small non-irrigated recharge zones were converted to urban use around the periphery of San Juan Bautista.
- No future development in the Bolsa area was assumed, as none of the current proposals appear certain.

Total vineyard acreage in San Benito County is expected to increase, but probably not as fast as it has historically. Based on San Benito County Agricultural Commissioner annual crop reports, vineyard acreage remained fairly stable at 3,700-3,800 acres during 2005-2012, then increased to 4,400 acres in 2017, as shown in **Figure 8-5**. If the growth rate of 2013-2017 continued, total acreage would roughly double by 2050 (increase by 4,500 acres). However, recent industry trends indicate a slowing of grape production in California and nationally. Silicon Valley Bank's "State of the Wine Industry Report 2019" (2020) identified a slowing in the rate of increase in U.S. wine consumption since 2013. This was attributed largely to generational changes in terms of disposable income and beverage preferences. The

report also noted “the slight oversupply of grapes in California and the inability of wineries to take price increases against higher input costs” in the face of weakening demand and past “premiumization” of wines.

The recharge zones shown on the 2068 land use map as future new vineyards total 3,531 acres, which is a 78 percent increase over the 2017 acreage. They are all within the extensive “Wine/Hospitality Priority Area” delineated in the 2013 San Benito County General Plan. They are also on moderate slopes near existing cultivated areas within the active model domain. To evaluate the worst-case impact of these new vineyards on consumptive use of groundwater, they are all on recharge polygons that were not irrigated prior to conversion. Finally, they are all assumed to be irrigated by groundwater rather than imported water.

The largest changes in average annual water budgets were in municipal and industrial (M&I) and agricultural pumping. Relative to baseline, M&I pumping increased in the Hollister and San Juan MAs by a total of 12,900 AFY (**Table 8-1**). Two additional City of Hollister wells are assumed to be installed in Hollister MA. Most of the vineyard expansion was assumed to occur in the Southern MA, where agricultural pumping increased by about 2,700 AFY. The increase in pumping was largely offset by changes in other head-dependent flows in the water balance. In the Southern MA, for example, percolation from the San Benito River and Tres Pinos Creek increased and groundwater discharge to those waterways decreased, with a combined shift equal to 87 percent of the increase in pumping. Similar interactions with surface water occurred in the Hollister MA. Overall, however, average annual water balances in three of the MAs became less positive or more negative.

Hydrographs of simulated groundwater levels at selected wells under the future growth scenario are shown in **Figure 8-6** and match the changes in the water balances. Comparison of growth scenarios to the future baseline indicated the following. Growth-scenario water levels were almost identical to future baseline water levels in the Southern MA (see hydrographs Donati and Ridgemark7). Water levels were generally slightly lower in the southern part of the Hollister MA, where most of the increase in pumping occurred (hydrographs 12-4-24N1 and 12-5-37B20). Increased wastewater percolation reduced drought water-level declines in the San Juan MA (hydrographs 12-4-26G1 and 12-5-30H1). Water levels were slightly lower in the Bolsa MA east of the Calaveras Fault (hydrograph 11-5-26B1) but mostly unchanged west of the fault (hydrograph 12-5-17D1).

Cumulative storage changes in the four MAs for growth scenarios differed somewhat from the baseline and climate change scenarios (see **Figure 8-3**) as follows.

- In the Southern MA, storage in the growth scenario tracked the baseline simulation almost exactly because increased pumping for vineyard expansion was offset by increased net percolation from the San Benito River and Tres Pinos Creek.
- In the Hollister MA, storage was consistently lower than under baseline conditions but without a long-term declining trend (similar to the climate change results). Groundwater pumping increased to supply some of the increased urban water use, but over the long run this was offset by increased net stream percolation and decreased outflow to other MAs.

- In the San Juan MA, storage was occasionally higher under the growth scenario than under the baseline scenario because increased future wastewater percolation occurred in the San Juan MA whereas increased future groundwater pumping was mostly in the Hollister MA.
- In the Bolsa MA, cumulative storage was similarly lower than under the baseline scenario and without a long-term declining trend. The growth scenario did not include any land use changes in the Bolsa MA, but two hypothetical future City of Hollister wells were located along San Felipe Road north of Fairview Road, where they would intercept some groundwater flow into the Bolsa MA.

The effects of climate change and future growth would be additive. The combination might be enough to initiate long-term storage declines, but it would certainly lower the minimum groundwater levels during droughts, potentially exceeding minimum thresholds in some locations. A combined growth plus climate change scenario was subsequently simulated (many months later, after various improvements and corrections to the underlying model), and that simulation did not show net storage declines from 1922 to 2007 except in the Bolsa MA, where there was an average annual storage decrease of 43 AFY, which is smaller than the uncertainty in modeling results.

Table 8-1. Average Annual Water Budgets under Future Baseline, Growth and Climate Change Scenarios

A. Southern Management Area

Water Balance Items	Future Baseline	2070 Climate	Growth
Groundwater Inflow	**(AFY)**	**(AFY)**	**(AFY)**
Subsurface inflow from external basins	0	0	0
Percolation from streams	24,916	26,825	25,933
Bedrock inflow	1,110	1,363	1,110
Dispersed recharge from rainfall[1]	4,424	5,820	4,641
Irrigation deep percolation	753	966	889
Reclaimed water percolation	0	0	0
Inflow from Hollister MA	838	879	833
Total inflow	32,041	35,853	33,406
Groundwater Outflow			
Subsurface outflow to external basins	0	0	0
Wells - M&I and domestic	(67)	(67)	(100)
Wells - agricultural	(6,895)	(10,511)	(9,638)
Groundwater discharge to streams	(19,371)	(18,994)	(18,039)
Riparian evapotranspiration	(1,611)	(1,611)	(1,590)
Outflow to Hollister MA	(2,987)	(3,025)	(2,879)
Total outflow	(30,930)	(34,207)	(32,247)
Net Change in Storage	**1,110**	**1,646**	**1,159**
Change from Baseline	**n.a.**	**536**	**49**

B. Hollister Management Area

Water Balance Items	Future Baseline	2070 Climate	Growth
Groundwater inflow	**(AFY)**	**(AFY)**	**(AFY)**
Subsurface inflow from external basins	0	0	0
Percolation from streams	21,715	24,661	22,482
Bedrock inflow	3,257	4,902	3,292
Dispersed recharge from rainfall[1]	18,008	21,030	18,926
Irrigation deep percolation	4,746	5,222	4,814
Reclaimed water percolation	2,304	2,304	4,585
Inflow from Southern MA	6,040	6,549	6,079
Total inflow	56,069	64,668	60,178
Groundwater Outflow			
Subsurface outflow to external basins	0	0	0
Wells - M&I and domestic	(3,777)	(4,099)	(15,018)
Wells - agricultural	(38,239)	(47,466)	(33,918)
Groundwater discharge to streams	(2,701)	(2,309)	(1,836)
Riparian evapotranspiration	(179)	(172)	(162)
Outflow to Bolsa and San Juan MAs	(10,219)	(10,045)	(8,761)
Total outflow	(55,114)	(64,091)	(59,695)
Net Change in Storage	**956**	**578**	**483**
Change from Baseline	**n.a.**	**(378)**	**(472)**

Tables show average annual values for water years 1922-2007. AFY = acre-feet per year.

[1] Dispersed recharge volumes adjusted from pre-processor to match model inflows

C. San Juan Management Area

Water Balance Items	Future Baseline	2070 Climate	Growth
Groundwater Inflow	**(AFY)**	**(AFY)**	**(AFY)**
Subsurface inflow from external basins	0	0	0
Percolation from streams	5,552	7,040	3,774
Bedrock inflow	538	846	-29
Dispersed recharge from rainfall[1]	7,254	8,635	7,628
Irrigation deep percolation	2,158	2,360	2,173
Reclaimed water percolation	2,314	2,314	6,583
Inflow from Hollister and Bolsa MAs	4,802	4,919	3,905
Total inflow	22,618	26,113	24,035
Groundwater Outflow			
Subsurface outflow to external basins	0	0	0
Wells - M&I and domestic	(473)	(473)	(2,104)
Wells - agricultural	(17,466)	(21,629)	(17,040)
Groundwater discharge to streams	(1,378)	(785)	(1,721)
Riparian evapotranspiration	(1,064)	(1,028)	(1,079)
Outflow to Bolsa MA	(1,675)	(1,835)	(1,687)
Total outflow	(22,055)	(25,751)	(23,631)
Net Change in Storage	**562**	**363**	**404**
Change from Baseline	**n.a.**	**(200)**	**(158)**

D. Bolsa Management Area

Water Balance Items	Future Baseline	2070 Climate	Growth
Groundwater Inflow	**(AFY)**	**(AFY)**	**(AFY)**
Subsurface inflow from external basins	4,744	5,054	4,852
Percolation from streams	3,588	3,762	3,597
Bedrock inflow	7	8	9
Dispersed recharge from rainfall[1]	9,699	11,307	9,638
Irrigation deep percolation	1,875	2,027	1,875
Reclaimed water percolation	0	0	0
Inflow from Hollister and San Juan MAs	5,081	4,805	4,541
Total inflow	24,994	26,963	24,512
Groundwater Outflow			
Subsurface outflow to external basins	(22)	(27)	(21)
Wells - M&I and domestic	(11)	(11)	(17)
Wells - agricultural	(19,877)	(21,494)	(19,880)
Groundwater discharge to streams	(2,955)	(2,964)	(2,360)
Riparian evapotranspiration	(231)	(221)	(223)
Outflow to San Juan MA	(1,883)	(2,250)	(2,034)
Total outflow	(24,979)	(26,967)	(24,534)
Net Change in Storage	**16**	**(4)**	**(22)**
Change from Baseline	**n.a.**	**(20)**	**(38)**

Tables show average annual values for water years 1922-2007. AFY = acre-feet per year.

[1] Dispersed recharge volumes adjusted from pre-processor to match model inflows

8.2. Summary of Projects and Management Actions

This section describes the projects and management actions that the Groundwater Sustainability Agency's (GSAs) have identified to maintain groundwater sustainability in North San Benito Basin.

Projects are substantial efforts that involve an increase in water supply or a reduction in demand for the GSP Area. *Actions* provide a framework for groundwater management including establishing GSP procedures or policies, filling data gaps with scientific studies or improved monitoring, and providing for funding.

The GSAs have been actively managing their local groundwater resources for decades and hence have been developing various projects and management actions, which are relevant to sustainability and in different stages of planning or development. Additional projects and actions have been identified, some as part of this GSP process, for assessment relative to identified data gaps and sustainability criteria. This section identifies projects and actions relevant to sustainability and provides description and assessment appropriate to the stage of planning or implementation. Selected projects/actions are described (consistent with the GSP Regulations) in terms of objectives, circumstances of implementation, public notice, permitting and regulatory process, timetable, benefits, costs, and how the action will be accomplished. The legal authority of the San Benito County Water District GSA (SBCWD GSA) and Santa Clara Valley Water District GSA are described in the Introduction Section 1.4. Both GSAs have the legal authority for planning, construction, and operation of surface water storage and groundwater basin management projects.

The projects and management actions have been organized into four project categories and six management actions as listed below.

Projects

- Develop Surface Water Storage (Pacheco Reservoir Expansion Project)
- Expand Managed Aquifer Recharge (MAR)
- Enhance Conjunctive Use
- Enhance Water Conservation.

Management Actions

- Improve Monitoring Program and Data Management System (DMS)
- Develop Response Plans
- Enhance Water Quality Improvement Programs
- Reduce Potential Impacts to groundwater dependent ecosystems (GDEs) (Steelhead and Riparian Vegetation)
- Provide Long-term Basin-wide Funding Mechanism
- Provide Administration, Monitoring, and Reporting.

The four projects involve conjunctive use of available supplies plus water conservation. These produce benefits by maintaining groundwater levels above minimum thresholds and thereby avoiding chronic groundwater level declines, storage depletion, subsidence, and reduction of potential impacts to GDEs.

The projects also promote water quality improvement by maximizing high quality imports and supporting basin outflows.

The first management action supports the cost-effective implementation of all projects and management actions. The next three management actions address response plans, water quality improvement, and protection of GDEs. These were identified during the GSP process to provide specific GSA responses to potential undesirable results. The last two actions provide the needed funding, administration, monitoring, and reporting on an annual basis.

8.2.1. Expected Benefits Relative to Sustainability Criteria and Objectives

As documented in Section 5 Water Balance and Section 6 Sustainability Criteria, the North San Benito Groundwater Basin is not in a state of overdraft. This is the result of long-term management, including importation of CVP water, which is used in conjunction with local surface water and recycled water supplies and local groundwater resources. The projects and management actions described here work together toward the sustainability objectives, namely: to provide a reliable and efficient groundwater supply, to provide reliable storage, to protect groundwater quality, to prevent subsidence, to support beneficial uses of interconnected surface waters, and to support integrated and cooperative water resource management.

Table 8-2 lists the projects and management actions and indicates the applicability of each project and action in providing expected benefits relative to five sustainability criteria topics relevant to North San Benito Groundwater Basin.

Each of the Projects and Management Actions is described in the following subsections.

Table 8-2 Expected Sustainability Benefits of Projects and Management Actions

Sustainability Criteria / Projects and Management Actions	Groundwater Levels	Groundwater Storage	Subsidence	Groundwater Quality	Connected Surface Water
Develop Surface Water Storage (Pacheco Expansion)	✓	✓			✓
Expand Managed Aquifer Recharge	✓	✓	✓	✓	✓
Enhance Conjunctive Use	✓	✓	✓	✓	✓
Enhance Water Conservation	✓	✓	✓		✓
Improve Monitoring Program and DMS	✓	✓	✓	✓	✓
Develop Response Plans	✓			✓	
Enhance Water Quality Improvement Programs				✓	
Reduce Potential Impacts to GDEs					✓
Provide Long-term Basin-wide Funding Mechanism	✓	✓	✓	✓	✓
Provide Administration, Monitoring and Reporting	✓	✓	✓	✓	✓

8.3. Develop Surface Water Storage (Pacheco Reservoir Expansion Project)

As discussed throughout the GSP, groundwater levels and storage in North San Benito Basin have been maintained at relatively high levels because of the availability of CVP supply. Maintenance of groundwater levels within recent historical ranges also brings benefits in reducing the risk of subsidence, maintaining groundwater quality, and supporting GDEs. However, reliability of CVP supply has been reduced by multiple factors including environmental considerations in the Sacramento-San Joaquin Delta and climate change. Given this situation, which is likely to increase with climate change, development of additional surface water storage is being planned. This allows direct use of CVP water when available and replenishment of groundwater storage for use during drought or shortage.

Potential options for additional surface water storage include Pacheco Reservoir expansion, Paicines Reservoir expansion, San Justo Reservoir expansion, new Hawkins Reservoir, and an additional offstream reservoir. At this time, the surface water storage project with the most advanced planning is the Pacheco Reservoir Expansion Project (PREP), described here. Planning for PREP is advanced, but the

project remains uncertain in part because of cost. While other surface water projects have been identified by SBCWD, Managed Aquifer Recharge and associated use of groundwater storage within North San Benito Basin is the alternative to PREP currently being developed (see Section 8.4).

As described in Section 8.1.1, the climate change modeling scenario indicates that the local climate in 2070 will be not only warmer but also wetter than the current climate. Given the challenges presented by cumulative effects of growth and climate change, consideration should be given to projects that can increase storage and use of local surface water supplies.

8.3.1. Description

The Pacheco Reservoir Expansion Project (PREP) is a collaborative effort of Valley Water, San Benito County Water District, and Pacheco Pass Water District (PPWD). The project would establish a new dam and expanded reservoir on the North Fork of Pacheco Creek. The existing dam and reservoir were constructed in 1939 and have been used for supplemental groundwater recharge along Pacheco Creek. The reservoir is located in Santa Clara County northeast of North San Benito Basin. PREP would increase Pacheco Reservoir's operational capacity from 5,500 acre-feet up to 140,000 acre-feet (SBCWD, 2021). Sources of water supply to the expanded project would be a combination of local watershed inflows and CVP supplies. A pipeline is planned to the Pacheco Pass Conduit, the CVP pipeline that delivers water from San Luis Reservoir located about 13 miles to the northeast. Deliveries from San Luis Reservoir also flow west through the Conduit to the San Felipe Division of the CVP, which includes Valley Water and SBCWD.

In 2018, Valley Water, the Pacheco Pass Water District and the San Benito County Water District collaborated to secure $484.5 million in funding from California's Water Storage Investment Program (WSIP), funded by the Proposition 1 Water Quality, Supply, and Infrastructure Improvement Act of 2014. The WSIP and funding for Pacheco Reservoir Expansion Project is administered by the California Water Commission (CWC), which provides current information on its website (CWC, 2021).

Although not a project sponsored by the GSAs, the B.F. Sisk Dam Safety of Dams Modification Project involves raising the dam that creates San Luis Reservoir (USBR, 2020). This project, being developed by the USBR and DWR, is intended to reduce seismic risk, but also will increase water storage behind the dam. As of 2020 environmental review and permitting have been completed and final designs are underway. Construction is scheduled for completion in 2028.

While the local inflows are within the jurisdiction of the Valley Water GSA, the CVP supplies would be provided by U.S. Bureau of Reclamation (USBR) as part of the Valley Water and SBCWD share of contracted CVP pumped water from San Luis Reservoir. Availability of CVP water will decrease in the future due to climate change. Simulations of the CVP system completed by DWR using its CalSim2 operations model indicate that the average annual availability of agricultural CVP water would decrease from 48 percent of contract amounts to 32 percent due to climate change between 2030 and 2070, and average annual M&I availability would decrease from 75 percent to 69 percent of contract amounts.

8.3.2. Feasibility and Level of Uncertainty

The CWC provided a technical review of the Pacheco Reservoir Expansion Project as part of its 2018 Technical Review (CWC, 2018). While focused on Valley Water, this review indicated that the project would be integrated with existing surface water and groundwater supplies and provide local operational

flexibility and contribute to SGMA, conjunctive use, and supply management. Uncertainty analyses provided to CWC by Valley Water addressed two extreme climate scenarios (2070 Wetter-Moderate Warming and 2070 Drier-Extreme-Warming) provided by WSIP. The analysis indicated that the project would provide additional public benefits under the extreme climate conditions (CWC, 2018). Additional feasibility studies (engineering, environmental, permitting) are underway; for example, the Draft Environmental Impact Report (EIR) is expected in 2022.

8.3.3. Project Implementation

As of early 2021, the project is in planning stages including environmental documentation, feasibility studies, and permitting (CWC, 2021). With implementation after 2029, project implementation would be integrated into Valley Water and SBCWD operations of the San Felipe Division of the CVP.

8.3.4. Public and Agency Noticing and Outreach

Information describing the project is provided on the websites of Valley Water, SBCWD and the CWC. The Valley Water website provides news, updates, and access to documents. Translation to multiple languages is provided by the website. In addition, Valley Water has invited the public to meetings and webinars and has encouraged commentary, for example on the EIR process. Valley Water also has provided presentations and tours to stakeholder groups. The CWC website provides quarterly reports on the project's status and expected completion dates.

8.3.5. Permitting and Regulatory Process

As of early 2021, Valley Water has initiated communication with many of the regulatory agencies that will require permits, approvals, certifications, and agreements (CWC, 2021). The estimated completion date for all required federal, state, and local approvals, certifications, and agreements is December 2024. The project description and framework for the draft EIR is being developed with an estimated public release in December 2021 for the Draft EIR and July 2023 for the Final EIR.

8.3.6. Legal Authority

PPWD, Valley Water, and SBCWD have collaborated to secure funding for this project from CWC, and Valley Water has entered into an agreement with CWC for project planning and environmental costs. PPWD owns and operates the existing Pacheco Reservoir, North Fork Dam, and related storage and conveyance infrastructure. PPWD is a California Water District formed in 1931 through Water Code §34000 to §38501 and has the authority to acquire, plan, construct, maintain, improve, operate, and keep in repair the necessary works for the production, storage, transmission, and distribution of water for irrigation, domestic, industrial, and municipal purposes, and any drainage or reclamation works.

The legal authority of Valley Water (Santa Clara Valley Water District) and SBCWD are described in the Introduction Section 1.4.

8.3.7. Project Benefits

Among the expected benefits of PREP are the following relevant to sustainability in North San Benito:

1. Increase reliability of imported water supplies to San Benito and Santa Clara counties.

2. Provide an emergency water supply to San Benito and Santa Clara counties.
3. Improve opportunities for water transfers through San Luis Reservoir.
4. Increase operational flexibility of water supplies at San Luis Reservoir.
5. Improve ability of PPWD to store water under its diversion and water use permit.
6. Provide additional water for groundwater recharge.
7. Improve delivered water quality, reducing taste and odor problems that result from seasonal algae blooms in San Luis Reservoir.
8. Increase suitable habitat in Pacheco Creek for the federally threatened South Central California Coast steelhead by providing suitable water flow and temperature to support the migration and survival of these fish.

The first four of these benefits involve increased reliability and flexibility of surface water import operations among the cooperating agencies and with USBR. These benefits are directly relevant to the measurable objectives for groundwater levels and storage and indirectly support avoidance of subsidence. Benefits will be evaluated by the GSAs in terms of increased imported water supply especially during drought and shortages. The benefits of additional water for recharge and water quality improvement have been evaluated by Valley Water in the context of overall conjunctive use of the subbasins in Santa Clara County including subbasins of the Santa Clara Valley Groundwater Basin and the Llagas Subbasin of the Gilroy-Hollister Basin. Such benefits accrue similarly to North San Benito Basin.

Effects of PREP on the North San Benito Basin groundwater were simulated on a preliminary basis using the numerical model. Specific benefits considered in this study included groundwater recharge and improvement of Pacheco Creek flows for steelhead.

Model inputs accounted for existing (non-project) and with-project conditions and included annual CVP use (agricultural, municipal, and percolation), municipal groundwater use basinwide, agricultural pumping in the Hollister and San Juan Management Areas, and Pacheco Creek inflow to the groundwater model. The general effect of the project was to maintain a nearly constant Pacheco Creek baseflow of about 15 to 20 cfs into the model. Groundwater model outputs included Pacheco Creek flow and percolation, groundwater elevation hydrographs for selected wells, and groundwater elevation contours. The preliminary findings included the following:

- PREP keeps groundwater in a “full” condition along Pacheco Creek down to about Highway 156.
- Farther downstream along Pacheco Creek PREP raises water levels a moderate amount, only during droughts. However, the reach below San Felipe Road has an existing problem with high groundwater levels.
- Throughout the rest of the basin, groundwater levels are occasionally different, but there is no significant long-term or drought-period benefit.
- PREP increases average annual use of CVP water by only about 1,100 AFY. It reduces average annual percolation of CVP water in local percolation basins by about 360 AFY due to new competing allocations of that water.
- Pacheco Creek stream flow is higher and more persistent during the dry season under PREP.
- During the steelhead migration season (Jan-Jun), flows are often smaller with PREP than under existing conditions because PREP would increase capture of runoff in the Pacheco Creek watershed.

- Overall, the water supply and habitat benefits of PREP to North San Benito basin are small. The net change in direct use and percolation of CVP water (740 AFY) equals only 2 percent of current total water use.

Benefits of the project in the future would be evaluated using the GSP monitoring program for groundwater levels, surface water, and GDEs.

8.3.8. Status and Timeline

The CWC website (CWC, 2021) provide up-to-date information on the project including quarterly reports. Construction to expand Pacheco Reservoir is anticipated to begin in 2024. As of 2021, construction is estimated to take at least eight years. Consequently, benefits would begin to accrue after 2032.

8.3.9. Estimated Costs and Financing

In 2018, Valley Water, Pacheco Pass Water District and San Benito County Water District collaborated to secure $484.5 million in WSIP funding, at the time accounting for more than one-third of the estimated $1.3 billion project cost. In 2020, Valley Water performed a more detailed design study which included an updated cost estimate. This design study indicated that construction costs for the proposed project had increased to about $2.5 billion, prompted largely by major changes to the dam and spillway design. In January 2021, the Valley Water Board of Directors instructed staff to continue with planning and design of the proposed project (SCVWD, 2021b). Valley Water is seeking federal funding and exploring other avenues to reduce the cost of the project to ratepayers.

Cost sharing for the Project and its potential operation and maintenance will be established in the Operating Agreement between Santa Clara Valley Water District, San Benito County Water District, and Pacheco Pass Water District.

8.4. Expand Managed Aquifer Recharge

Climate change and growth in urban and agricultural water demand will both tend to undermine the sustainability of groundwater conditions in the North San Benito Basin by increasing groundwater declines during dry periods. Those declines can be offset by increasing the amount of recharge during wet periods, provided the recharged water remains in storage until the next drought. Funded by a Sustainable Groundwater Planning (SGWP) Grant as part of this GSP, the MAR project has been initiated with a feasibility study. Documentation of this study will be provided on the SBCWD website in the Technical Memorandum (TM), *North San Benito Managed Aquifer Recharge Feasibility and Location Assessment Study*.

8.4.1. Description

The MAR study addresses the entire basin to evaluate potential locations, several methods of recharge, and several sources of water. To evaluate locations, the MAR study uses best available information on recharge parameters and applies a detailed geographic information system (GIS) index-overlay method to evaluate potential locations. Numerical modeling also was applied to assess issues such as mounding, migration, and recovery of recharge water. The combination of water source, method, and location that

currently appears to have the greatest advantages and the fewest disadvantages involves recharge of CVP water using injection or Aquifer Storage Recovery (ASR) wells in the Hollister MA.

Other water sources and recharge mechanisms were evaluated but deemed less promising at this time.

- Diversion of water from local streams to offsite percolation basins was evaluated, with the conclusion that insufficient water would be available for a cost-effective project. Future climate change effects on local hydrology (potentially including increased rainfall and runoff) could warrant reassessment of local streamflow as a water source.
- Percolation of urban stormwater already occurs in detention basins in Hollister, but for a regional project, land costs and local percolation rates are not sufficiently favorable.

Methods considered for recharge of CVP water included percolation basins, temporary flooding of agricultural fields (AgMAR), and injection or ASR wells. Percolation basins are a proven means of recharge in North San Benito, but disadvantages include the relatively low percolation rates of most local soils and the high cost of land for a facility that is used only sporadically. Former gravel pits may provide unique opportunities, which will be evaluated as opportunities arise. AgMAR, or flooding of agricultural fields when surplus CVP water is available, was not selected for further evaluation at this time. AgMAR is difficult to implement on a periodic basis because of the many and complex arrangements with numerous landowners that would be required. In addition, field flooding would accelerate downward migration of accumulated salts and nitrates (and other agricultural chemicals) in the soil.

Injection wells have been selected as the best method for implementing MAR in the Basin. Disadvantages including relatively high installation and operation and maintenance costs are outweighed by advantages, including low land costs, avoidance of percolation rate limitations, and a long potential recharge season. Injection wells also have two important water quality benefits. First, injection avoids moving poor-quality shallow groundwater down to deep water-supply aquifers, and second, it dilutes the mineral content of native groundwater and thereby improves the quality of water pumped from nearby downgradient water supply wells. ASR wells are advantageous in providing recovery/production capabilities in addition to recharge.

8.4.2. Water Source and Reliability

The primary source is CVP water that is available in wet years when the agricultural allocation is in excess of 50 percent of SBCWD's contract amount. An estimated eleven injection wells could accommodate 6,000 AFY of desired recharge capacity. This amount was targeted by SBCWD analysis of CVP availability given historical use rates of SBCWD agricultural customers and using output from DWR's CalSim2 model of statewide CVP and State Water Project operations. The CalSim2 model produces monthly estimates of CVP water availability over the 1922-2003 hydrologic period. The analysis thereby incorporates best available information on CVP availability; the intent of the project is to increase imported water reliability through storage in the groundwater basin.

8.4.3. Feasibility and Level of Uncertainty

To evaluate the feasibility of the MAR project, the numerical model has been applied to injection well scenarios for injection-only (MAR) wells and for ASR wells. Design of the scenarios reflect additional siting considerations, including where recharge is most needed and how long the recharged water can

be retained in storage before being lost to groundwater outflow. These considerations led to a focus on Hollister MA, which contains the area slowest to recover following historical overdraft during the 1940s to 1970s. This is the area that has the greatest need of supplemental recharge and retains it the longest. Scenarios were designed with hypothetical wells as follows:

- The first is an injection-only scenario in which eleven MAR injection wells are located along CVP distribution pipelines close to and roughly upgradient of City of Hollister and SSCWD municipal supply wells. This arrangement maximizes the water-quality benefit of injection by allowing the recharged water to be recovered at nearby existing potable supply wells.
- The second scenario involves eleven ASR wells near the north end of Hollister. For the ASR scenario, the amounts and timing of injection are the same as for the MAR injection-only scenario. Extraction is assumed to occur in all non-injection years at a rate that balances the injected and extracted volumes over the simulation period.

8.4.3.1. Results of Scenario Simulations

The effects of the injection well and ASR well scenarios were each simulated and compared to a reference simulation that consisted of the future baseline simulation plus future growth and climate change. For the injection wells, two scenarios were run, one with injection concentrated into a four-month season (November-February) and another with injection over nine months of each year (June-February).

Hydrographs were prepared to allow comparison of results for the reference simulation and the injection well scenario at selected wells. Simulations in some wells showed high water levels in the injection wells that indicated the need to spread injection out over nine months. While the presence of faults sharply truncates the mounding in some directions, the effect spread substantially during the six years following injection.

For the ASR well scenario, hydrographs in selected wells show prominent spikes in water levels during injection years, with water levels declining back to near baseline levels within about four years. During longer periods between injection years, water levels drop below the baseline levels because of extraction at the ASR wells. Overall, the ASR scenario is water-budget neutral: increased recharge from injection is balanced in subsequent years by increased extractions, with the latter spread out over all of the municipal wells.

Analysis also included contour mapping of differences in water levels between the ASR well scenario and the reference simulation. This allowed documentation of long-term storage of water and consideration of mounding effects, which also indicated that a longer operating season is preferable not only to minimize well interference but also to decrease the number of wells needed and their required injection rates.

The feasibility analysis also includes comparison of average annual water budgets for the injection well and ASR well scenarios with the future growth reference simulation. Water budget changes were reviewed in terms of increase in total recharge contributed by the injection wells, increased groundwater storage, decreased percolation from streams, increased groundwater outflow to streams, and decreased outflow to the Bolsa and San Juan MAs. All of the above changes in water budgets are relatively small, because on an average annual basis the injected CVP water represents only about one percent of total inflows to the Hollister MA. The spillover effects on water budgets in the San Juan and Bolsa MAs represent even smaller percentages of those budgets.

8.4.3.2. Level of Uncertainty

The preceding analyses demonstrate the conceptual feasibility of injecting and storing surplus CVP water at the management-area scale. Land requirements are low for wells, and construction costs are significant but predictable. One uncertainty with injection or ASR wells is the overall transmissivity of the aquifer system at each well location, which is locally variable. In general, low injection capacities can be overcome with additional wells, but at increased cost. Another uncertainty is the amount and method of treatment that would be required for water prior to injection. At a minimum, water must be highly filtered to prevent clogging of the aquifer formation near the well. Adjustments of pH or TDS might be needed to prevent desorption of clays or metals in the aquifer. The Regional Water Quality Control Board (RWQCB) and/or California Division of Drinking Water (DDW) might impose additional requirements to protect ambient groundwater quality and public health.

8.4.4. Project Implementation

The MAR study has demonstrated the conceptual feasibility of injection and/or ASR recharge projects using CVP. Next steps are likely to include additional investigation of water quality issues, focusing on potential geochemical interactions between recharge water sources (CVP and potentially a CVP/groundwater blend) and native groundwater. Subsequent field work may include pilot injection testing at existing wells; installation and testing of test injection wells; and a pilot injection program. Both the MAR Project and North County Project (see Section 8.5.3) are focused on the Hollister MA, and coordination or merging of the two is being considered. Project development also includes planning, predesign, and design for needed treatment, injection, and conveyance facilities; continued evaluation and modeling (system modeling, groundwater, and geochemical modeling); environmental compliance and permitting; institutional agreements; land acquisition; cost estimating and financing; and stakeholder outreach.

8.4.5. Public and Agency Noticing and Outreach

Documentation of the MAR study and findings will be provided on the SBCWD website in a TM, *North San Benito Managed Aquifer Recharge Feasibility and Location Assessment Study*. During the study, updates were provided to the TAC and the presentations uploaded to the SBCWD website, where they are available to the public. Future progress on the MAR efforts will be summarized in the Annual Groundwater Reports and associated public meetings.

8.4.6. Permitting and Regulatory Process

The Central Coast RWQCB and the Drinking Water Division of the SWRCB are the primary agencies responsible for permitting injection and ASR wells. The permitting process will likely entail technical studies of the quality and treatment of the source water and potential reactions of injected water with aquifer materials and ambient groundwater. San Benito County Water District issues permits to construct any type of well in San Benito County, and these wells would need this type of permit. Implementation of the MAR project would require compliance with the California Environmental Quality Act (CEQA), in the form of an environmental impact report.

8.4.7. Legal Authority

SBCWD's powers originate from the San Benito County Flood Control and Water Conservation District Act passed by the California Legislature in 1953. That statute gives SBCWD broad powers "to construct,

maintain, alter and operate any and all works or improvements, within or without SBCWD, necessary or proper to carry out any of the objects or purposes of this act", which include the power "to store water in surface or underground reservoirs". Injection and ASR wells would clearly fall within the scope of these powers.

8.4.8. Project Benefits

Managed aquifer recharge in general, and injection or ASR wells specifically would provide three benefits to water users in northern San Benito County:

- Increase long-term recharge and supply of groundwater in the Basin by importing and storing additional CVP water when it is available. This would decrease storage depletion and water-level declines during droughts, helping to avoid exceeding the minimum thresholds for those sustainability indicators. The additional recharge also protects against reduced recharge or increased demand associated with future growth and climate change.
- Improve the long-term salt balance of the basin by increasing natural outflow from the Basin.
- Locally improve groundwater quality near the injection wells by diluting it with CVP water. ASR wells or injection of CVP water close to and upgradient of water supply wells would improve the quality of the extracted water compared to extracting native groundwater.

8.4.9. Status and Timeline

For the recharge study, initial investigations, preliminary feasibility studies, conceptual designs and initial cost analysis are part of this GSP as summarized in the TM, *North San Benito MAR Feasibility and Location Assessment Study* (to be provided on the SBCWD website). Overall, engineering studies, permitting and CEQA compliance can be expected to take 1-2 years.

8.4.10. Estimated Costs and Financing

Initial costs will be presented in the *North San Benito MAR Feasibility and Location Assessment Study* being prepared in 2021. At time of writing, four options are being explored with different conceptual designs and capacities and with various levels of water treatment. Estimated capital costs range between $69 million and $81 million. Estimated annual yields range from 2,085 to 3,085 AFY, with estimated yield costs ranging from $1,990 to $2,900 per AFY.

Financing may be through local funding and/or state and federal grants and loans. Past projects, such as the Hollister Urban Area Water Project, have been implemented through a combination of local financing and state grants. Opportunities for outside financing (grants or loans) will be fully explored from state water programs and federal infrastructure funding. For local financing, the agencies will need to update their financial plans and rate studies. Rate study updates should include a review of both rates and connection fees.

8.5. Enhance Conjunctive Use

Projects that enhance conjunctive use include the following:

- Hollister Urban Area Water and Wastewater Project
- City of San Juan Bautista Regional Water and Wastewater Solution

- North County Project
- Zone 3 Operations Planning Tool.

8.5.1. Hollister Urban Area Water and Wastewater Master Planning Project

The Hollister Urban Area Water and Wastewater Master Planning Project has been the major means for regional cooperation and coordination of water, wastewater, and recycled water facilities for the urban areas in the North San Benito Basin. It was first initiated in 2004, followed by a master plan produced in 2008 (HDR, 2008) and a Master Plan Update in 2017 (HDR, 2017).

As of 2021, regional water and wastewater planning is being expanded to include the City of San Juan Bautista. This includes development by SBCWD and City of San Juan Bautista of a San Juan Bautista Water Supply Plan (WSP) for provision of high quality treated CVP water to San Juan Bautista. Planning also is being conducted by SBCWD, City of Hollister, and City of San Juan Bautista to convey wastewater to the City of Hollister Wastewater Treatment Plant. The planning addresses issues the City of San Juan Bautista currently has related to meeting drinking water standards for its potable water system and meeting waste discharge requirements for its wastewater discharges to a tributary of San Juan Creek.

8.5.1.1. Description and Implementation

The Hollister Urban Area Water and Wastewater Master Planning Project (Master Plan) has been implemented through the steps summarized in the next paragraphs. It continues as an active planning process for the foreseeable future. Relative to groundwater sustainability, the Master Plan provides for conjunctive use of CVP supply, groundwater, wastewater, and recycled water. While CVP supply is sourced from beyond GSA jurisdictions and is not always reliable (see Plan Area Section 2.1.2), the groundwater, wastewater, and recycled water are local sources and the conjunctive use planning increases supply reliability.

2008 Master Plan. The Master Plan was initiated through the 2004 Memorandum of Understanding (MOU) developed among the City of Hollister (City), San Benito County (County), and SBCWD. The 2004 MOU was subsequently amended in 2008 to include Sunnyslope County Water District (SSCWD). The 2008 Master Plan identified projects or program elements for water, wastewater, and recycled water with implementation through 2023. The Hollister Urban Area (HUA) was defined to include the City of Hollister and adjacent unincorporated areas of San Benito County designated for urban development.

The 2008 Master Plan was a major milestone for regional cooperation and coordination of water, wastewater, and recycled water facilities to serve the HUA. The 2004 MOU described the principles, objectives, and assumptions that formed the basis of the 2008 Master Plan, focusing on the following goals:

- Improve municipal, industrial, and recycled water quality.
- Increase the reliability of the water supply.
- Coordinate infrastructure improvements for water and wastewater systems.
- Implement goals of the Groundwater Management Plan.
- Integrate recommendations of the Long-term Wastewater Management Plans (LTWMP) with the Master Plan.
- Support economic growth and development consistent with the City of Hollister and San Benito County General Plans and Policies.
- Consider regional issues and solutions.

The HUA water projects defined in 2008 include: (1) purchases or transfers of imported water supplies, (2) North County Groundwater Bank, (3) new urban wells, (4) upgrade of the Lessalt Water Treatment Plant, (5) new surface water treatment plant [West Hills], (6) demineralization of urban wells, (7) a new pipeline to Ridgemark, and (8) new treated water storage.

Wastewater elements include (1) Ridgemark Wastewater Treatment Plant upgrades, (2) expansion of the City of Hollister Water Reclamation Facility, and (3) the Cielo Vista Estates connection to the City of Hollister Water Reclamation Facility. Recycled water elements include (1) Phase 1 recycled water facilities (2) Phase 2a and Phase 2b recycled water facilities, and (3) Ridgemark recycled water facilities. Non-structural solutions include water conservation, salinity education, water softener ordinance, new development connections to the city sewer, and other measures.

2017 Master Plan Update. Implementation of the 2008 Master Plan process involved major capital improvement projects including:

- Lessalt Water Treatment Plant Upgrade and Fairview Road Transmission Pipeline
- West Hills Water Treatment Plant and Transmission Pipeline to City Well Nos. 4 and 5
- SSCWD New Well No. 11
- City of Hollister Water Reclamation Facility Upgrade
- SSCWD Ridgemark Wastewater Treatment Plant
- Expansion of the recycled water system for agricultural reuse

In addition, SBCWD improved water supply reliability during droughts by purchasing additional out-of-basin water supplies, entering into an agreement with Valley Water to participate in the Semitropic Water Bank, and working with the USBR to renegotiate its historical use baseline for the municipal and industrial portion of its CVP contract. The Master Plan process has also included water conservation programs (see Section 8.6 Enhance Water Conservation) that have successfully reduced water demand in the HUA. In addition, both SSCWD and the City have adopted water softener programs to remove self-regenerating water softeners in the HUA (see Section 8.11 on Water Quality Improvement Programs).

With achievement of 2008 Master Plan goals, the agencies proceeded with a new memorandum of understanding and update of the 2008 Master Plan. The 2014 Memorandum of Understanding (2014 MOU) was developed between the City, SBCWD, and SSCWD to facilitate and guide this update. The 2014 MOU incorporated the principles, objectives, and assumptions from the 2004 MOU. It also reaffirmed the institutional framework and responsibilities of the Governance and Management Committees. The overall objectives of the Master Plan were updated to include:

- Provide continuous improvement towards achieving drinking water and recycled water quality goals.
- Increase dry year water supply reliability.
- Provide adequate water supply to respond to long-term growth needs.
- Continue to address water, wastewater, and recycled water needs through coordinated regional solutions.

The 2017 Update also was coordinated with related planning efforts including the 2015 Hollister Urban Area Urban Water Management Plan (UWMP), the City's distribution system master plan, and this GSP. The following issues were identified for evaluation in the Master Plan Update.

- Update water demand and wastewater flow projections.
- Review and evaluate previously identified long-term water supply options.
- Review drinking water goals for Total Dissolved Solids (TDS) and hardness.
- Review goals for recycled water TDS.
- Evaluate the need, timing, and estimated cost of the following facilities:
    - Expansion of the West Hills WTP,
    - Crosstown Pipeline,
    - Groundwater Demineralization or Softening,
    - Modifications and/or expansion of the City's Water Reclamation Facility and the SSCWD Ridgemark Wastewater Treatment Plant,
    - Expanding the recycled water system, and
    - Major infrastructure improvements to the water distribution system and the wastewater collection system.

In 2014, the California Division of Drinking Water (DDW) adopted water quality regulations to limit the levels of hexavalent chromium, Cr(VI), to a maximum of 10 parts per billion (ppb) in drinking water. This regulation was subsequently rescinded in 2017 and currently Cr(VI) levels are controlled in California drinking water by existing regulations that include an maximum contaminant level (MCL) of 50 ppb. However, consideration of the lower regulatory levels indicated significant issues with City of Hollister and SSCWD groundwater compliance. In response, in 2015 the City prepared a Hexavalent Chromium Compliance Plan for Groundwater Supply to provide a reliable and cost-effective plan for the City to manage in municipal water supply wells in accordance with DDW regulations. The 2017 Master Plan Update also provided recommendations for compliance with the Cr(VI) regulations at the time. While subsequently rescinded, the Master Plan Update has increased its focus on providing high quality water to the HUA.

8.5.1.2. Water Source and Reliability

The Master Plan process involves use CVP supplies, which are available to SBCWD through its existing contracts for municipal and agricultural supplies. As discussed in the 2020 UWMP (Todd, 2021), the reliability of CVP is expressed by variable annual allocations; while agricultural allocations may be zero in some years, municipal allocations have been 25 to 100 percent. DWR has provided simulation of future CVP allocations, which support planning to address this uncertainty.

Local groundwater is reliable, as managed by SBCWD in partnership with local agencies. Recycled water also is locally controlled and reliable.

8.5.1.3. Feasibility and Level of Uncertainty

The Master Plan process is based on a succession of engineering studies and design, hydrogeologic investigations (including field study and numerical modeling), and planning. Uncertainties with regard to the groundwater basin setting (local groundwater quantity and quality) are addressed by focused investigations (e.g., test drilling) and by ongoing monitoring.

8.5.1.4. Public and Agency Noticing and Outreach

The 2008 Master Plan included development of a Communications Plan, which identified key stakeholders including environmental organizations, developers, special interest groups, local business owners, agricultural operators, drinking water and sewer customers, and political organizations. Five public workshops were held. The Communications Plan has been updated in the 2017 Update to keep the public and other agencies engaged in and informed about the projects or management actions.

8.5.1.5. Permitting and Regulatory Process

The 2017 Master Plan Update indicates that agreements between agencies will be required to implement projects providing joint benefits. These agreements will be similar to the memoranda of understanding developed for previously completed projects, such as the Lessalt and West Hills WTPs and agricultural use of recycled water.

The 2017 Update also indicates that numerous federal, state, and local permits will also be required for implementation. The required permits will be identified during the preparation of the engineering predesign studies and environmental compliance documents. Recommended facilities will require environmental compliance with CEQA to evaluate the environmental impacts of the projects. Project-specific compliance would be determined on a case-by-case basis for individual projects. If federal grants or loans are used to pay for specific facilities, additional environmental review may be required to comply with the National Environmental Policy Act (NEPA). In addition, if federal facilities are impacted, such as the Hollister Conduit, NEPA compliance also may be triggered.

8.5.1.6. Legal Authority

The legal authority of SBCWD is described in the Introduction, Section 1.4.

8.5.1.7. Project Benefits

The Master Plan process has specified objectives (listed in Section 8.5.1.3) that allow qualitative evaluation of project benefits and in the case of water quality, quantitative goals that can be measured by compliance with drinking water and recycled water regulations. As described in the 2017 Update, the Master Plan process has been coordinated with this GSP. Accordingly, recent Master Plan objectives and projects have been considered in light of benefits to meeting sustainability management criteria, including changes in basin conditions (e.g., climate change) over time. The Master Plan supports maintenance of measurable objectives, particularly pertaining to levels, storage, and water quality.

8.5.1.8. Estimated Costs and Financing

The 2017 Update provides estimated costs for recommended facilities with costs presented in five-year intervals to 2025. Total costs were estimated at $31 million for the recommended facilities (HDR, 2017). Completed projects include the crosstown pipeline with an extension to City of Hollister wells 4 and 5, at a cost of $7.2 million (SSCWD, 2021). Other projects are underway including North County groundwater project and new well for the City of Hollister; other projects are in early planning stages.

As with completed projects, financing of recommended projects is through local funding and/or state and federal grants and loans. The agencies track opportunities for outside financing (grants or loans) from state water programs and federal infrastructure funding. For local financing, the agencies update their financial plans and rates.

8.5.1.9. Status and Timeline

As described in the 2017 Update, the planning period for the Master Plan Update extends from 2015 to 2035. The initial year of the planning period was selected to provide a common baseline for data related to land use, water supply and demand, and wastewater flows. The final year of the planning period coincides with the planning horizon of the 2015 UWMP. In terms of implementation, major infrastructure improvements would be completed through 2025 and the Master Plan would be updated no later than 2025.

8.5.2. City of San Juan Bautista Regional Water and Wastewater Solution

Regional water and wastewater planning is being expanded to help resolve City of San Juan Bautista issues with groundwater supply and wastewater quality.

The groundwater in and around the City of San Juan Bautista is poor quality with elevated nitrates, TDS, and hardness. The City of San Juan Bautista manages a water system with three groundwater production wells (wells 1, 5, and 6). In March 2020, well 6, the City's newest well, was taken offline because routine testing indicated nitrate concentrations increasing toward the MCL, which was subsequently exceeded. Well 6 was the third well in recent history to be affected by excessive nitrates. Such loss of well capacity is critical to the City because its best source, well 1, does not have the capacity to reliably meet City water demands and interruption of production from Well 5 potentially could result in water shortage.

The City's wastewater system collects wastewater from approximately 800 residential, commercial, industrial, and institutional accounts, and provides treatment at its wastewater treatment plant (WWTP) with subsequent discharge of the effluent into a creek ("No-Name Creek"). Because of local geologic conditions, the creek (or effluent discharge) is not considered to recharge the groundwater basin and instead flows out of the North San Benito Basin to the Pajaro River. This creek is subject to federal EPA permit requirements that are enforced through a shared permit with the SWRCB.

The WWTP operates under discharge permits with limits for salinity (chloride, sodium, and TDS), but has been and remains in violation of these three limits for several years (Stantec, 2020). The elevated chloride, sodium, and TDS concentrations have been driven by agricultural processing (which is being mitigated by new limits on and pre-treatment of industrial discharges) and by the groundwater hardness that results in use of self-regenerating water softeners throughout the community. Such water softeners result in elevated chloride, sodium, and TDS concentrations that are discharged into the City's wastewater collection system and then pass through the WWTP, contributing to the discharge permit violations.

This discharge of excessive TDS prompted the EPA and the City to work together on a schedule for the City to come into compliance with its permit by December 21, 2023. Alternatives for wastewater treatment improvements have been identified (Stantec, 2020), an alternative has been selected involving regionalization with Hollister WWTP and use of water from West Hills WTP. Currently the City of San Juan Bautista is working toward the regional water and wastewater solution, working closely with SBCWD and City of Hollister.

8.5.2.1. Description

The Regional Solution involves importing high quality water from the West Hills WTP to replace groundwater, removing residential self-generating water softeners, reducing industrial salt loading to the City wastewater, and then conveying San Juan Bautista wastewater to the City of Hollister WWTP.

For the water supply element, the San Juan Bautista Water Supply Plan (WSP) is being planned as a cooperative effort of SBCWD and the City of San Juan Bautista in which SBCWD provides imported CVP water to San Juan Bautista by means of a pipeline from the West Hills Water Treatment Plant. Water from West Hills WTP is only moderately hard (97 mg/L) and has less total dissolved solids (260 mg/L)

than the water provided by the City of San Juan Bautista wells (comparable TDS from Well 1 is 628 mg/L) (Akel, 2020). As proposed, West Hills WTP surface water would be conveyed to the City of San Juan Bautista through a six-mile-long gravity-fed pipeline and blended with the City's groundwater. As of March 2021, SBCWD and San Juan Bautista are developing a mutual agreement for the WSP, which will provide for planning and implementation of the project, CEQA compliance, financing, and institutional arrangements.

With delivery of improved water quality, domestic water softeners will not be needed in the City of San Juan Bautista. A water softener ordinance is being developed that establishes a program for the timely removal of existing residential brine discharging water softening appliances and prohibition of the installation of new ones. The discharges from agricultural processing facilities are in the process of being addressed by establishing a new industrial pre-treatment program and by limiting industrial users to discharge only domestic wastewater into the City's sewer collection system (Stantec, 2020).

For wastewater treatment, the City of San Juan Bautista, in cooperation with City of Hollister, is developing a wastewater plan that involves conveyance of San Juan Bautista wastewater to the City of Hollister WWTP. This project assumes use of the higher quality West Hills water and implementation of the domestic and industrial salinity control measures noted above in order to meet City of Hollister effluent limits.

8.5.2.2. Water Source and Reliability

This project is in planning stages and technical, environmental, and regulatory feasibility are being established. Reliability of supply for the City of San Juan Bautista will be increased because the City will have two distinct sources: imported CVP water from the West Hills WTP and local groundwater supply from its own wells. The reliability of CVP is discussed in the 2020 UWMP (Todd, 2021); municipal allocations in recent years have ranged from 25 to 100 percent but are used conjunctively with local groundwater. CVP water has been used directly by the City of Hollister and SSCWD since the 2002 construction of the Lessalt Treatment Plan, and while representing an imported source, is reliable.

8.5.2.3. Feasibility and Level of Uncertainty

This project is in planning stages and technical, environmental, and regulatory feasibility are being established through engineering studies and preliminary design.

8.5.2.4. Project Implementation

Project implementation, driving toward required permit compliance by December 2023, is now in planning stages. The City of San Juan Bautista Water Compliance Plan is underway with timelines into 2022 to develop the fiscal strategy, water import, and wastewater export (Reynolds, 2021).

8.5.2.5. Public and Agency Noticing and Outreach

Community engagement for the project has included workshops, a community survey, utility bill inserts, and public presentations to the City Council. The water and wastewater issues also have been presented in the online news source, BenitoLink, with updates on project status.

8.5.2.6. Permitting and Regulatory Process

An initial review of potential environmental impacts is provided in the City's 2020 Wastewater Master Plan Appendix A (Stantec, 2020), noting that a CEQA Initial Study will be provided. Permit requirements also are listed.

8.5.2.7. Legal Authority

The legal authority of SBCWD is described in the Introduction Section 1.4 while the water supply roles and responsibilities of the cities of San Juan Bautista and Hollister are indicated in Section 2.1.

8.5.2.8. Project Benefits

Project benefits include provision of a reliable and high-quality water supply to the San Juan Bautista community, measurable in terms of delivered water quality. Because of the improved delivered water quality, use of water softeners can be reduced with resulting improvement of wastewater quality. Wastewater conveyed to the City of Hollister can be recycled, representing a new source of supply. Discharge of high-TDS water to the Pajaro River Tributary will cease; this is considered to have minimal effect on the groundwater basin because of limited recharge along the creek channel. However, cessation of the wastewater discharge will be measurably beneficial to surface water quality and reflected in compliance with discharge permit requirements. Project benefits also include enhancement of the working relationships with federal and state agencies with regulatory responsibility for water quality.

8.5.2.9. Estimated Costs and Financing

Total project costs for the Regional Solution are $13 million (see Table 24 in Stantec, 2020). The San Juan Bautista Water Compliance Plan includes development of a fiscal strategy, including a rate study and approval of new rates and applications for grant funding.

For the Water Supply Plan, the City of San Juan Bautista and SBCWD would complete an MOU that includes mutual financial commitments whereby SBCWD will finance and build the water supply pipeline to San Juan Bautista. The agreement will establish a base rate for water and cost recovery for the capital investment and operations and maintenance. This may be similar to the financing agreement between SBCWD and the City of Hollister and SSCWD for the Hollister Urban Area Water and Wastewater Master Planning Project. The City of San Juan Bautista is seeking a similar agreement with the City of Hollister wherein San Juan Bautista will finance, design, and build a force main to convey its wastewater to the Hollister WWTP.

8.5.2.10. Status and Timeline

A proposed project schedule is presented in the 2020 Wastewater Master Plan Appendix A (Stantec, 2020) with planning to be completed in November 2023.

8.5.3. North County Project

The North County Project, described in the 2017 Master Plan Update (HDR, 2017), will develop production well capacity in the northeastern portion of the North San Benito Basin to actively manage groundwater storage, to increase municipal water supply and drought year reliability, and to improve municipal water quality for the City of Hollister. The "North County" area has not been formally delineated but is generally located in the northern Hollister and northeastern Bolsa Management Areas east of the Calaveras Fault, north of the City of Hollister and extending up Pacheco Creek Valley. The

area has been defined mostly on the basis of relatively low concentrations of total dissolved solids (TDS) in groundwater.

8.5.3.1. Description and Implementation

The North County Project involves siting, design, and installation of new production wells, with the possibility of including ASR operations (see also Section 8.4). The long-term goal is to develop up to 5,000 acre-feet per year (AFY) of local groundwater supply that is reliable during drought. The Project uses local groundwater from the North San Benito Basin that has a high level of certainty, given the long-term monitoring and management by SBCWD, availability of hydrogeologic information in the area, and results of numerical groundwater modeling.

Phase I would provide an estimated 1,000 acre-feet/year (AFY) of new high quality water supply to the northerly part of the combined City and SSCWD water distribution system. Facilities would include new wells, pipelines, treatment (if required), storage tank and booster pump station. Phases 2 and 3 would provide up to 5,000 AFY of reliable water supply to agricultural and M&I users. This supply would be provided by a wellfield and blended with CVP supply through a connection to the Hollister Conduit. The effort is being led by SBCWD in cooperation with the City of Hollister and SSCWD.

Numerical groundwater flow modeling has been used to assess the general technical feasibility, potential effects on groundwater levels and Pacheco Creek streamflow, and effects of the Pacheco Reservoir Expansion Project (Todd, 2018). Scenarios included various combinations of a new well for the City of Hollister, a wellfield to supply groundwater into the Hollister Conduit, the Pacheco Reservoir Expansion Project, and expansion of existing conjunctive use of groundwater and imported water. The simulation results indicate that new pumping at the proposed City well and Phase II and III well fields would not cause groundwater levels to fall below historical minimum water levels. Thus, all scenarios appear feasible from a hydrogeologic standpoint.

To further evaluate optimal sites for the Phase I City of Hollister well, SBCWD staff collected groundwater level data for wells in the North County (SBCWD, 2020). Review of these data have been used to focus on an area north of the Hollister Airport; to collect, analyze, and review water quality (including TDS, nitrate, sodium, iron, manganese, arsenic, and total hardness); and to identify the best site. An available parcel was selected with physical and legal access for test drilling. As of March 2021, a test well has been installed and sampled.

Next steps involve a feasibility study with evaluation of well yield and water quality, definition of any need for treatment and process, refinement of conceptual facilities plans, updating operational scenarios and distribution system modeling, updating estimated costs and economic analysis, and preparation of a feasibility study report.

8.5.3.2. Water Source and Reliability

The source of water for the project is local groundwater, which is sustainably managed by SBCWD GSA in partnership with local agencies including City of Hollister and SSCWD.

8.5.3.3. Level of Uncertainty

The project is based on best available information about the North San Benito Basin and a series of investigations that have involved numerical groundwater flow modeling, water quality sampling and analysis, installation and sampling of a test well, and engineering feasibility studies.

8.5.3.4. Public and Agency Noticing and Outreach

Public noticing has occurred through the public meetings of the boards of directors for SBCWD and SSCWD, and City of Hollister City Council. Initial outreach for the North County Project has been included in the 2017 Update and continued as part of this GSP.

8.5.3.5. Permitting and Regulatory Process

As summarized in the 2017 Master Plan Update, multiple institutional agreements may be needed to implement the North County Project depending on its scope:

- Agreements between SBCWD and Valley Water and/or Pacheco Pass Water District (PPWD) for operation of the existing Pacheco Dam and Reservoir or an expanded facility.
- Agreement between the USBR and the SBCWD to use the Hollister Conduit for transmission of North County groundwater (Warren Act).
- Agreements between North County landowners and SBCWD for banking/exchange of groundwater and CVP supplies.

A MOU has been developed in 2019 among SBCWD, City of Hollister, and SSCWD for Phase I of the North County Groundwater Project. The MOU summarizes the project, its objectives and scope of a feasibility study, program management, budget, and cost sharing.

The 2017 Update also indicates that numerous federal, state, and local permits will also be required for implementation. The required permits will be identified during the preparation of the engineering predesign studies and environmental compliance documents. For this project, a complete EIR will be required. If federal grants or loans are used to pay for specific facilities, additional environmental review may be required to comply with NEPA. In addition, if federal facilities are impacted, such as the Hollister Conduit, NEPA compliance also may be triggered.

8.5.3.6. Legal Authority

The legal authority of SBCWD is described in the Introduction Section 1.4 while the water supply roles and responsibilities of the City of Hollister are indicated in Section 2.1.

8.5.3.7. Project Benefits

Project benefits of the North County Project relate to financing, fire suppression flows, and water deliveries through the City of Hollister and SSCWD water distribution system. Relevant to SGMA objectives for groundwater levels and storage, the Project enhances conjunctive use by providing an additional 1,000 AFY of reliable high quality water supply to the HUA, especially during dry years. Relative to water quality, quantitative goals can be measured by improved quality of groundwater delivered for City of Hollister drinking water purposes.

8.5.3.8. Estimated Costs and Financing

The 2017 Update provides estimated costs for the North County Groundwater Project at $6.7 million. As with other Master Plan projects (see Section 8.5.1.5), financing would occur through local funding and/or state and federal grants and loans.

8.5.3.9. Status and Timeline

Planning and investigations are underway. The estimated timetable for the North County Project, as described in the 2017 Update, indicated that most work and costs would occur in 2021-2025.

8.5.4. Zone 3 Operations Planning Tool

SBCWD owns and operates two reservoirs along the San Benito River. Hernandez Reservoir (capacity 17,200 AF) is located on the upper San Benito River in southern San Benito County. Paicines Reservoir (capacity 2,870 AF) is an offstream reservoir between the San Benito River and Tres Pinos Creek. It is filled by water diverted from the San Benito River, with some of the diversions consisting of natural runoff and some consisting of water released from Hernandez Reservoir. Water stored in the two reservoirs is released for percolation in Tres Pinos Creek and the San Benito River to augment groundwater recharge during the dry season. Zone 3 is the zone of benefit for the operation of these facilities (see **Figure 1-2)**.

The project includes development, application, and periodic review and refinement of the Zone 3 Operations Planning Tool (Micko, 2017). This Tool creates annual operations plans for Hernandez and Paicines Reservoirs and for re-diverting Hernandez Reservoir releases to Paicines Reservoir at the San Benito River Diversion (Hill) Diversion. Source water for this project is local San Benito River streamflow as regulated by Hernandez and Paicines reservoirs, which are owned and operated by SBCWD.

8.5.4.1. Description

In 2017, SBCWD sponsored development of the Zone 3 Operations Planning Tool to create annual operations plans for Hernandez and Paicines Reservoirs and for re-diverting Hernandez Reservoir releases to Paicines Reservoir at the San Benito River Diversion (Hill) Diversion. The objective for developing the tool was to standardize and facilitate the annual effort to plan Hernandez operations under differing hydrologic and water supply conditions consistent with an adopted water supply management strategy. The Zone 3 Operations Planning Tool generates annual operation plans for coordinated management of surface water and groundwater supplies in the San Benito River watershed.

The Planning Tool is based on available hydrologic data, including precipitation at the Hollister and Hernandez rain gauges, current flow at the Tres Pinos Creek and San Benito River streamflow gauges (through online links), depth to groundwater data for selected wells for April, Hernandez and Paicines reservoir storage and releases, and imported water information including the CVP Agricultural Allocation, other imported supplies for the current year, if any, and current San Justo Reservoir storage.

The annual plans then are developed based on current hydrologic conditions, current surface water supplies, and spring groundwater levels. The plans are developed consistent with an overall basin management strategy to effectively utilize local supplies and imported water supplies.

8.5.4.2. Project Implementation

The Project is implemented annually. The Tool provides for input of hydrologic data, and the program should be run in April, May, and June. The program creates a Zone 3 Operations Plan. The plan includes target monthly Hernandez Reservoir release rates, total release volume and October 1 carryover storage. The Plan also includes target diversion to and releases from Paicines Reservoir. Current and projected end-of-season operational storage levels are provided for Zone 3 groundwater subbasins. The initial plan includes program-selected release and transfer values.

8.5.4.3. Water Source and Reliability

The source of water includes San Benito River flows, as regulated by SBCWD through operations of its Hernandez and Paicines reservoirs. These flows are reliable in terms of local control and continuing

operations but are subject to drought and climate change. Effects of climate change are addressed in Section 8.1.1 Climate Change.

8.5.4.4. Level of Uncertainty

The Planning Tool is based on available hydrologic data and application of hydrologic accepted analyses and reasonable assumptions. Uncertainties with regard to the basin setting (local hydrology and groundwater levels) are addressed by ongoing monitoring.

8.5.4.5. Public and Agency Noticing and Outreach

The outcome of reservoir operations is summarized in the Annual Groundwater Report, including reservoir water budget information for Hernandez, Paicines, and San Justo reservoirs and annual total releases from Hernandez and Paicines reservoirs.

8.5.4.6. Permitting and Regulatory Process

The Planning Tool development required no permitting, regulatory, or environmental review process.

8.5.4.7. Legal Authority

The legal authority of SBCWD is described in the Introduction Section 1.4.

8.5.4.8. Project Benefits

Releases from Hernandez and Paicines reservoirs are managed to maximize percolation along the stream channels of the San Benito River and Tres Pinos Creek and to avoid losses out of the basin. The Planning Tool helps optimize these benefits, with benefits to Southern MA and also to the Hollister and San Juan MAs downstream. This tool helps maintain measurable objectives pertaining particularly to groundwater levels and storage, and groundwater quality by optimizing recharge of relatively good quality surface water.

8.5.4.9. Estimated Costs and Financing

Original 2017 costs to develop the Planning Tool involved consultant costs (Micko Consultants) and amounted to $29,260.

8.5.4.10. Status and Timeline

This project is ongoing, with continuing accrual of benefits.

8.6. Enhance Water Conservation

Water conservation is an ongoing program for sustainable water supply, with additional measures for drought and water shortage. In San Benito County, local water agencies—including SBCWD, City of Hollister, City of San Juan Bautista, and SSCWD—formed the Water Resources Association of San Benito County (WRA) to implement water conservation and water resource protection, including Best Management Practices (BMPs) for water demand management. For its service area in Santa Clara County (including areas in North San Benito Basin), Valley Water has extensive water conservation efforts conducted through its Water Conservation Program (SCVWD, 2021c).

8.6.1. Description

The San Benito WRA retains a Water Conservation Coordinator, who is a SBCWD employee, to serve the water conservation needs for the WRA residential, commercial, and agricultural water users.

Responsibilities of the Coordinator are to administer, implement, analyze, and evaluate water management and conservation programs, including program cost, water consumption patterns, and estimates of water savings and demand reduction. The Coordinator is responsible for specific BMPs listed in the UWMP, including utility operations (e.g., ordinances, metering programs, tiered pricing), public education and outreach, residential programs, business programs, and landscape programs (Todd, 2021).

Implementation of the water conservation program for the HUA is achieved through the UWMP, (Todd 2021), prepared by a partnership of SBCWD, the City of Hollister, and SSCWD. UWMP preparation is closely coordinated with the Water and Wastewater Master Plan (described in Section 8.5) and this GSP. The UWMP is prepared consistent with DWR guidelines.

Water conservation in SBCWD's CVP service area (Zone 6) is covered by the Agricultural Water Management Plan (AWMP) which implements water conservation efforts within the agricultural sector. SBCWD implements an Enhanced Watershed Management Program through the AWMP and includes volumetric and incentive pricing, farm irrigation and infrastructure capital improvements, and other waste reduction measures (SBCWD, 2015).

8.6.2. Project Implementation

While the conservation efforts listed in Section 8.6.1 are ongoing, implementation of additional conservation measures is triggered by drought or other shortage conditions.

SBCWD, City of Hollister, SSCWD, and Valley Water have all passed ordinances/resolutions to address shortages in water supply. In addition, the HUA agencies have created a Water Shortage Contingency Plan (WSCP), which serves as a guide for adjusting supply and demand in response to a water shortage. (Todd, 2021). The WSCP (presented in the HUA UWMP) includes a six-stage plan addressing water shortage stages of up to 10 percent, 20 to 30 percent, 40 to 50 percent, and greater than 50 percent of water supply. Valley Water similarly has a WSCP implemented through the Valley Water UWMP (SCVWD, 2021a).

Implementation of restrictions and prohibitions is based on a fundamental prioritization of domestic supply for human health and safety over non-essential uses, including landscape irrigation. In the event of a water shortage, water service may be restricted or prohibited for non-essential uses, recognizing that certain end users may be required to save more water than others because of their specific use. Prohibitions on end uses will affect user types differently:

- For urban residential users (who typically rely on HUA agencies for domestic supply), water service will continue during a shortage with restrictions on outdoor water use in Stages 1 through 5 and prohibitions in Stage 6.
- Rural residential users of CVP M&I water (i.e., five-acre parcels) would also be subject to restrictions and prohibitions on outside water features and landscape irrigation.
- Landscape irrigators (e.g., golf courses, dedicated irrigation meters) are subject to increasing restrictions for Stages 1 through 5 and the prohibition in Stage 6.
- Commercial businesses are subject to all restrictions in Stages 1 through 5 and prohibitions in Stage 6.

The specific water demand reduction actions are specified in the WSCP along with the respective trigger stages. The communication protocols also are described through which the water agencies alert the public when a water shortage stage has occurred and is lifted. Legal authorities of the agencies also are documented.

In 2014, SBCWD passed a Water Shortage Emergency resolution asking for voluntary conservation by Municipal and Industrial users as well as small parcel customers. Another resolution was passed establishing an over-use charge for agricultural users (SBCWD, 2021).

8.6.3. Water Source and Reliability

Water conservation actions address all sources of water supply with the exception of recycled water, which is considered a reliable resource. These actions increase reliability of water sources by reducing demand.

8.6.3.1. Level of Uncertainty

Water conservation efforts have a measurable effect on water demand, as documented in the HUA and Valley Water UWMPs. For example, in 2015, in response to drought, the HUA community decreased water demand by 23% in response to increased public outreach and education and restrictions similar to Stage 2 of the WCSP. Similarly, water use in Santa Clara County over the past seven years has decreased by about 21% compared to 2013, the wet year prior to the 2014-2016 drought (Valley Water News, 2021). It is noteworthy that water demand has not rebounded to pre-drought water use. This is due in large part to the public outreach and permanent changes enacted during the drought. Turf that was removed has not been replaced, high efficiency appliances remain in homes, and landscape plans continue to keep irrigation efficient.

While these improvements have resulted in decreased water demand, the future potential gains from the rebate and retrofit programs are less certain and may be limited by demand hardening. The WRA will continue to provide public outreach and education about irrigation efficiency. While these programs are difficult to account per unit water savings, the overall effect of reducing demand during the drought demonstrates the overall water savings.

8.6.4. Public and Agency Noticing and Outreach

Public outreach is ongoing within the HUA and Valley Water as part of demand management measures. The nature and extent of outreach that has been implemented is quantified in the respective UWMPs (Todd, 2021; SCVWD, 2021a) that are updated every five years. Additional noticing and outreach are implemented when shortages occur. Implementing any stage of the WCSP involves clear and timely communication with the public, stakeholders, key decisionmakers, and local, regional, and state governments. The WSCP Communication protocols allow agencies to efficiently communicate any current or predicted water shortages and response actions that are triggered. Communication protocols are outlined for each stage in the UWMPs.

8.6.5. Project Benefits

Benefits are enhanced water conservation, which is fundamental to cost-effective management of water supplies for all beneficial uses in North San Benito. Water conservation directly helps to maintain measurable objectives relative to groundwater levels and storage, with indirect benefits to preventing

subsidence and maintaining connected surface water, especially in drought. As part of the UWMP five-year updates, demand management measures and WSCPs are evaluated and updated as appropriate. The evaluation process includes quantifying water conservation efforts of each demand management measure. For the HUA, the effectiveness of the WSCP was quantified during the 2011-2016 drought, when HUA agencies were able to reduce water demand in 2015 by more than 25 percent.

8.6.6. Estimated Costs and Financing

The HUA agencies provide funding for the WRA. The annual budget has increased from $324,000 in fiscal year 2015-2016 to $372,000 in fiscal year 2020-2021 (not including additional consultant funding for development of the UWMP). The water waste ordinances are enforceable for retailer customers in the City of Hollister and SSCWD. Enforcement costs are a part of each agency's overhead. The Valley Water conservation budget for FY 2017 was $5.7 million (for the entire county), funded by water charges, cost-share agreements, and grants (SCVWD, 2016).

The HUA Agencies proactively prepare for periodic revenue shortages and periods of increased spending that occur during droughts. All surplus revenues that SBCWD, City of Hollister, and SSCWD collect are currently reinvested into the water supply system in preparation for potential revenue reduction during water shortages. Based on projected and observed declines in revenue during shortages, the entities determined rate increases may be needed in the WSCP Stage 2 through 6 to maintain the same revenue.

8.6.7. Status and Timeline

The water conservations efforts are ongoing with demand management measures always in place. When drought or other shortages occur, the WSCP is enacted based on each shortage stage. Urban water management plans (including WSCPs) are updated every five years, consistent with the water code and guided by DWR.

8.7. Improve Monitoring Program and DMS

As presented in Section 7.5, Assessment and Improvement of Monitoring Network, this GSP has identified data gaps and has made recommendations to fill those gaps. Some of these are addressed elsewhere in this GSP. Most notably, **Appendix H** summarizes siting of the new dedicated monitoring wells installed in 2021 with DWR SGWP Round 3 grant funding. Monitoring program and Data Management System (DMS) improvements described in this section are organized as follows:

- Measure agricultural groundwater extraction
- Improve monitoring well network and DMS
- Improve water quality monitoring program
- Enhance surface water gaging.

8.7.1. Description

These managements actions are applicable mostly to the San Benito County portion of the Basin, within the jurisdiction of the SBCWD GSA. For the small area in Santa Clara County (3,354 acres), Valley Water GSA can utilize or develop its own or similar programs applicable to its jurisdiction. Data sharing is ongoing between the GSAs.

8.7.1.1. Measure Agricultural Groundwater Extraction

GSP Regulations require annual reporting of groundwater extractions except for those of de minimis users. Municipal pumping is regularly metered and reported, and SBCWD has measured agricultural pumping in Zone 6 using pump power meter records. However, a single, reliable, and consistent method of measuring agricultural pumping is needed for the entire basin. This management action pertains to the San Benito County portion of the basin.

Alternative methods of measuring agricultural groundwater extraction have been evaluated as part of this GSP, with input from the TAC and stakeholders, see Section 1. Alternative methods considered for North San Benito have included 1) use of pump power meters, 2) use of in-line discharge meters on wells, and 3) remote sensing techniques. Criteria to evaluate the three alternatives have included:

- Accuracy and reliability relative to purpose
- Costs and allocation of costs between the GSA and well owner
- Feasibility and timing of implementation
- Ease of ongoing data collection and maintenance
- Well owner acceptability and cooperation.

To summarize, use of power meters has been removed from further consideration because it is not sufficiently accurate and reliable. Use of in-line meters may be a viable option because it is relatively accurate (with regular checking/maintenance), understood by well owners, and gives growers direct access to their pumping data. Drawbacks of meters include a possible lack of acceptance by owners, slow implementation as hundreds of meters are installed by well owners, the probable need for SBCWD to establish access to each well for verification, the cost of the meter to the well owner, and the need for SBCWD staff time and ongoing access to the meter.

8.7.1.2. Remote sensing can overcome many of the drawbacks of the other methods, but it is a relatively new and evolving technology. To further explore this option, SBCWD conducted a brief pilot study in 2021 to test the remote sensing services offered by a private vendor. Improve Monitoring Well Network and DMS

SBCWD has had a quarterly groundwater level monitoring program since 1977 that has provided the basis for groundwater level contour maps, change maps, hydrographs, groundwater level profiles, and storage change computations. Assessment of the monitoring network (Section 7) has identified data gaps including uneven distribution across the basin, reliance on private production wells, and insufficient data on vertical gradients. Many private wells used in the network lack well construction information, and others lack a unique ID, do not have an accurate reference point, and/or have access issues. The 2021 installation of grant-funded, dedicated monitoring wells provides significant improvement to the network, as does the ongoing effort to assess the network coverage, to identify more existing wells for the program, and to digitize well information.

This management action involves regular review and evaluation of wells included in the SBCWD monitoring network and programs (levels and quality) as an ongoing, adaptive effort. This would include potential discontinuation of wells with inadequate documentation or problematic access and wells that are deemed unnecessary, and it would include addition/installation of monitoring sites as needed. It also includes review of monitoring schedules and frequency to match the monitoring objective, e.g., quarterly monitoring of groundwater levels for Key Wells and a minimum for other wells.

Other recommendations include improvement of the well inventory part of the DMS:

- Develop and implement a program to provide unique well identification beginning with monitored wells. This would allow discontinued use of well names as identifiers and would comply with data and reporting standards described in GSP Regulations §352.4. For all monitored wells, document well information (e.g., unique site ID, identified reference point, well completion report if available, etc.) in a GIS-linked database; this is a priority task for GSP implementation.
- Develop a procedure to regularly document private well locations and construction information and compile into a well inventory database; this will increase knowledge of private wells that potentially could be affected by regional groundwater level or water quality changes. This documentation would occur annually and involve data compilation for all newly permitted wells and incremental documentation of previously permitted wells or wells in an identified gap area.
- Enhance the DMS with cross-referencing of monitoring sites (groundwater and surface water) relative to location and monitoring for regional groundwater level, groundwater quality, shallow groundwater, subsidence, or managed aquifer recharge.

8.7.1.3. Enhance Outreach on Well Permitting

As indicated in Section 2.1.5.5, SBCWD has authority for well permitting in San Benito County. to minimize construction of new wells with insufficient well depth, SBCWD will provide outreach to local well drillers and prospective well owners, for example, through its website and well permitting process. Such outreach will inform well drillers about the MTs for groundwater levels. This will likely involve description of the MTs and Key Wells, provision of information (for example, a general map of MT depths to water) to guide well drillers, and explanation of the potential risks of shallow wells.

8.7.1.4. Improve Water Quality Monitoring Program

SBCWD has established a water quality monitoring program with quarterly to semiannual sampling of groundwater at about 20 wells (see Section 6.6.4.1). This program is intended to protect beneficial uses and support groundwater management decisions, with some wells included to represent regional conditions and others to track local problems. The distribution of monitored sites is uneven, with most sites in Hollister and San Juan MAs (see **Figure 4-15**). Additional potential improvements to the SBCWD monitoring network have been identified, including the 2021 program to install shallow and deep dedicated monitoring wells for improved distribution of sites and better representation of basin conditions geographically and vertically (see **Appendix H**).

Another recommendation is to review wells that are monitored as part of the RWQCB Irrigated Lands Regulatory Program (ILRP), evaluate them for inclusion in the SBCWD program, and add them, with mutual agreement with the well owner. This action would involve an initial systematic review of the ILRP wells, subsequent acquisition of access agreements, and then periodic review and update.

The evaluation of sustainability criteria for water quality constituents of concern—TDS and nitrate—also highlighted the problem of legacy loading. This involves historical salt and nitrate loading at the ground surface (for example, due to irrigation, use of fertilizers, or wastewater disposal) and the unknown lag time until the loading affects deeper groundwater zones used by wells. Uncertainties include the amount of historical loading relative to current loading at any given site and the rates at which constituents are moving down to affect deep pumping zones. Because of legacy loading, current water quality results and trends may be indicative of past, not current, land uses and practices.

Given this problem, additional investigations and monitoring are recommended (but not yet scoped) to better understand vertical distribution and migration of TDS and nitrate in the subsurface. A focus would

be on shallow groundwater conditions that reflect recent and current loading, but studies also should include sampling in areas where the water table is relatively deep, in order to assess nitrogen removal in the vadose zone. The pilot program noted in section 8.7.1.2 also explored ways to provide information to growers to help manage nitrogen and phosphorus loading.

8.7.1.5. Enhance Surface Water Gaging

As noted in the December 2018 Technical Memorandum on Data to Support GSP Preparation, only four stream gages are currently operated in the Basin (see Figure 3-3) and a stream gage on upper Tres Pinos Creek has been identified as a priority item. As shown on Figure 3-3, two gages are at or near the outlet of the North San Benito Basin and two gages are near surface water inflow sites, one on upper Pacheco Creek and another on the San Benito River above Paicines.

A new stream gage on lower Tres Pinos Creek above Paicines could allow measurement of inflow (depending on specific location) from the middle and upper reaches of Tres Pinos Creek, Las Aguilas Creek, and Los Muertos and Quien Sabe creeks. A gage just below the confluence of middle Tres Pinos Creek and Los Muertos Creek would provide data for a previously ungaged watershed. The streamflow data will inform the understanding of groundwater conditions in Southern Management Area, refinement of the groundwater flow model and the Zone 3 Operations Planning Tool, and improvement of surface water recharge operations along Tres Pinos Creek and the San Benito River.

The four existing gages represent collaboration of SBCWD and the U.S. Geological Survey (USGS), in which USGS installs, operates, and maintains the gage. A similar approach is assumed for a potential Tres Pinos gage.

8.7.2. Project Implementation

These monitoring and data management actions can be implemented as follows:

- **Investigate Alternatives for Measurement of Agricultural Groundwater Extraction**. This is a high-priority action that is required specifically in GSP Regulations with annual reporting. At this time, SBCWD is exploring multiple remote sensing-based options for estimating ET as a means of estimating and tracking total and groundwater use.
- **Improve Monitoring Well Network and DMS.** Development of unique well identification program and improvements to the DMS, such as cross referencing and organization of a well inventory, should be started without delay and completed within two years. Documentation of private well locations and construction can be phased, with priority given to areas with numerous domestic wells that might be adversely impacted by drought. The initial effort should be completed in the first 5-year period. Thereafter the inventory should be updated annually.
- **Improve Water Quality Monitoring Program**. Installation of dedicated shallow and deep monitoring wells was initiated in 2021. Review of wells in the ILRP for addition to the SBCWD program can be initiated with the next triennial water quality update.

Enhance Surface Water Gaging. It is assumed that gage installation will involve agreement between SBCWD and USGS, in which USGS installs, operates, and maintains the gage. Communication with USGS can begin within the first-five year period. An implementation issue is the cost of installing and maintaining a surface water gage. It is assumed that SBCWD would explore a cost-sharing agreement

with USGS. However, other options can be explored such as acoustic water level sensors that can be mounted on the undersides of bridges.

8.7.3. Public and Agency Noticing and Outreach

Progress on the recommended management actions will be summarized in the Annual Groundwater Reports and associated public meetings.

8.7.4. Permitting and Regulatory Process

The permitting, regulatory process, and environmental review for installation of shallow monitoring wells will be summarized in the Well Drilling and Construction Technical Memorandum for the North San Benito Basin Dedicated Groundwater Monitoring Wells, which is being prepared in 2021.

. The various studies and procedural improvements require no permitting, regulatory, or environmental review process. Installation of a surface water gage is categorically exempt from CEQA review as a data collection activity (2019 CEQA guidelines §15306)

8.7.5. Legal Authority

The legal authority of SBCWD GSA is described in the Introduction, Section 1.4, and includes monitoring, conduct of investigations, and agreements with other agencies. This broad authority includes measurement of groundwater extraction (as in Zone 6). SGMA not only empowers but requires GSAs to measure and report groundwater extraction on an annual basis.

8.7.6. Project Benefits

Benefits of these four management actions involve the following:

- **Investigate Alternatives for Measurement of Agricultural Groundwater Extraction**. Accurate measurement of agricultural pumping will benefit understanding of the water balance and will inform model updates and refinement. This in turn supports improved management of groundwater levels and storage (pertinent to measurable objectives for levels, storage, subsidence, and connected surface water). Measurement of groundwater extraction will provide a basis for a groundwater extraction fee planned for the future that will fund continued extraction measurements in the San Benito portion of the basin.
- **Improve Monitoring Well Network and DMS.** These management actions support accurate and cost-effective data management that support all measurable objectives across the entire basin. Particular benefits may accrue to areas with numerous domestic wells that might be adversely impacted by drought.
- **Improve Water Quality Monitoring Program**. These management actions promote water quality monitoring efforts across the basin and provide most benefit with regard to water quality objectives.
- **Enhance Surface Water Gaging.** Installation of a gage on Tres Pinos Creek will benefit understanding of the water balance, support update and refinement of the groundwater flow model, and allow refinement of the Zone 3 Operations Planning Tool that helps optimize recharge. This support maintenance of measurable objectives relative to groundwater levels,

storage, and connected surface water. Benefits will accrue particularly to the Southern MA and also to Hollister and San Juan MAs.

8.7.7. Estimated Costs and Financing

Estimated costs and financing involved with these four management actions are described below.

- **Investigate Alternatives for Measurement of Agricultural Groundwater Extraction**. At this time, SBCWD is exploring multiple remote sensing-based options for estimating ET as a means of estimating and tracking groundwater use and is planning to initiate a full-scale remote sensing program in 2022; an estimated annual cost is $125,000 per year and would be funded by the groundwater extraction fee for the San Benito portion of the basin.
- **Improve Monitoring Well Network and DMS.** Development of a procedure for annual compilation of well information and maintenance of a well inventory database should occur in the first two years as part of the annual monitoring and reporting effort, which will be funded by the Groundwater Management Fee. Ongoing data compilation and well inventory update will be conducted by SBCWD staff.
- **Improve Water Quality Monitoring Program**. Additional review of the SBCWD groundwater quality monitoring program and potential addition of ILRP wells would likely by accomplished as part of the annual monitoring and reporting effort, which will be funded by the Groundwater Management Fee.
- **Enhance Surface Water Gaging.** Installation of a USGS stream gage is estimated to cost about $32,500 (as of 2017) with a cost of about $19,000 per year for annual operation and maintenance. Other options (see Section 8.7.2) may be less costly. Financing will be funded by the Groundwater Management Fee.

8.7.8. Status and Timeline

As described in Section 8.7.2, implementation is planned to start in the first five-year period and to continue as needed with immediate and continuing accrual of benefits.

8.8. Develop Response Plans

The discussion in Section 6.2.6 for setting Minimum Thresholds for chronic lowering of groundwater levels concludes that such undesirable results are not occurring in North San Benito and that the basin is managed sustainably relative to groundwater levels. Nonetheless, declining groundwater levels are likely to occur at times due to drought and climate change and may approach Minimum Thresholds. Regular groundwater level monitoring and annual reporting will provide an early warning system; however, a response plan is warranted.

Similarly, review of water quality data indicates potential for rapid increases in some constituents (see for example, **Figure 4-19**). While likely indicating a local problem and not a basin-wide sustainability issue, the usefulness of a systematic response program was recognized.

This management action is to develop such response plans.

8.8.1. Description

This management action is applicable throughout the North San Benito Groundwater Basin. However, the focus here is the San Benito County portion of the Basin, within the jurisdiction of the SBCWD GSA. For the small Basin area in Santa Clara County (3,354 acres), Valley Water GSA can utilize or develop its own or similar programs applicable to its jurisdiction. Data sharing—including discussion of any significant groundwater level declines—is ongoing between the GSAs.

A response program for declining groundwater levels would be based on the groundwater level monitoring program and linked to monitoring of the Key Wells. As groundwater level declines are tracked, initial response actions would include data verification; evaluation of the rate, extent, and pattern of declines; identification of factors causing the decline; assessment of potential undesirable results in nearby wells; and consideration of potential response actions. Initial responses would likely involve intensified outreach and educational efforts by the GSA (or WRA) and promotion of voluntary efforts. Responses may involve a series of stages similar to those in Water Shortage Contingency Plans. Response efforts would be developed specific to the management area and situation.

- For the Southern MA, SBCWD would likely begin more active recharge along the San Benito River and Tres Pinos Creek, with surface water management and percolation to increase groundwater in storage for the agricultural areas and Paicines community upstream of Swanson's Bluff. This action would be modified considering downstream conditions in the Hollister and San Juan MAs, which could be affected by similar conditions at the same time.
- For the Hollister and San Juan MAs, responses would likely involve more active/focused conjunctive use operations including additional purchases and percolation of imported water (in average and wet years when more water is available) and acceleration of projects such as the MAR project.
- For the Bolsa MA, supplemental water sources are not readily available. Following the initial response actions listed above, specific measures to manage water demand should be identified (for example, a tiered pricing structure) and classified to provide staged responses to problems of increasing severity.

Similarly, a response program for rapid, potentially adverse changes in groundwater quality would be developed based on the water quality monitoring program with links to the Water Quality Key Wells. The program would be focused on detecting local sources of degradation that impact groundwater quality relatively strongly and rapidly. This is distinct from the ongoing water quality improvement programs that address the slow, dispersed loading of salts and nitrates from agricultural, rural, and urban activities. The intent is early detection of local impacts that can enable appropriate actions to halt further local contamination before the impacts become severe or widespread. As with the groundwater levels program, the water quality program would include data verification, evaluation of potential sources of the water quality degradation, assessment of potential undesirable results in nearby wells, and consideration of potential response actions. Potential actions would include focused outreach and education, and cooperation with the appropriate regulatory agency.

8.8.2. Project Implementation

Given definition in this GSP of Minimum Thresholds at Key Wells and implementation of the GSP monitoring network, development of these response programs can proceed during the first five-year

period. These actions are intended to be rapid responses on an as-needed basis, thus should be "on the shelf" and ready when needed, with periodic review and update.

8.8.3. Public and Agency Noticing and Outreach

Notice to the public and other agencies that the development of these management actions is being considered can occur through the Annual Report and associated public presentations. Each response action may involve specific and more intensive outreach and noticing efforts, as described above. Thereafter, the response programs will be ongoing, and implemented when needed.

8.8.4. Permitting and Regulatory Process

It is anticipated that the rapid response programs would be implemented within the existing authorities and water management and thus would not trigger any permitting requirements, environmental review, or regulatory process.

8.8.5. Legal Authority

The legal authorities of SBCWD and Valley Water are described in the Introduction Section 1.4.

8.8.6. Project Benefits

Benefits would involve the capability to respond systematically and rapidly to potential adverse water level decline and water quality deterioration issues. Benefits would accrue to the entire North San Benito community with rapid identification and resolution of potential problems, indicated by a slowing of groundwater level declines and cessation/cleanup of potential contaminant sources. These actions help maintain the measurable objectives relative to groundwater levels and groundwater quality.

8.8.7. Estimated Costs and Financing

Costs to develop such programs are estimated at $15,000 each. Implementation will be dependent on the actual scope of the programs and the severity and extent of groundwater level declines or quality problems, with most issues potentially handled within the general operations of SBCWD staff, but some issues warranting more intensive investigation.

8.8.8. Status and Timeline

Program development can start within the first five-year period with accrual of benefits as the programs are used.

8.9. Enhance Water Quality Improvement Programs

As discussed in Section 6, Sustainable Management Criteria, local groundwater water quality is naturally mineralized and affected by human activities, including salt and nitrate loading. While groundwater quality has not been shown to change significantly and groundwater continues to be used for beneficial uses, an objective of the GSAs is to improve groundwater quality and the strategy of this GSP is to identify and implement management measures to reduce nitrate and salt loading. Measures already undertaken and to be continued include operation of HUA water treatment plants that allow expanded

use of CVP water and thereby improve wastewater quality, HUA wastewater treatment improvements (nitrate reduction) and water recycling, HUA and WRA programs to reduce salt loading from water softener use, and the RWQCB ILRP, which requires nitrate budgeting for most irrigated fields in San Benito County.

8.9.1. Description

Additional management actions identified to enhance water quality include collaboration with UC Extension and other organizations toward reduced nitrate and salt loading by agriculture, support to farmers for use of remote sensing to optimize fertilizer applications, and cooperation with the County and local agencies on regulation of water softeners and wastewater treatment/disposal including onsite wastewater treatment systems (see also Sections 8.5.1.1 and 8.5.2 on current efforts).

Additional analyses of the salt balance may be considered, potentially using the numerical model to assess salt outflows. A general indication of salt flushing from the basin is provided by the water balance information in Section 8.1 Simulation of Future Conditions with Climate Change and Growth. Groundwater discharge to streams in the San Juan and Bolsa MAs are flows that remove salts from the Basin. However, those outflows represent only 6.6 percent and 10.7 percent of total inflows to those MAs, respectively. Thus, it is likely that salts will continue to accumulate in the Basin. Increasing outflow as a percentage of inflow generally decreases the long-term equilibrium salt concentration in a basin, but the locations and salinities of individual sources of recharge make a significant difference. Modifying the regional groundwater flow model to simulate salt loading and transport would provide a clearer picture of long-term salinity trends and equilibrium concentrations.

A Salt and Nutrient Management Plan (SNMP) was developed for the San Benito County portion of the Basin in 2014.[12] As summarized in Section 4.5, this SNMP identified sources of salts and nutrients, assessed potential impacts of recycled water projects, confirmed ongoing measures to manage salt and nutrient sources, and laid out a monitoring program. Update of the Salt and Nutrient Management Plan (SNMP) would build on the new information provided by monitoring of the new dedicated shallow and deep monitoring wells, triennial updates (planned for 2022 and 2025), and addition of ILRP wells (see Section 8.7.1.2).

8.9.2. Project Implementation

Implementation of these management actions can begin as needed during the first five-year period with preparation of the SNMP in the second five-year period. Cooperation with other agencies is ongoing.

8.9.3. Public and Agency Noticing and Outreach

Notice and outreach to the public and other agencies about these management actions will occur through the Annual Report and WRA outreach. The SNMP process includes agency involvement and public outreach.

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[12] Santa Clara County areas of the Basin were not included in the SNMP study area. Nonetheless, data were provided on maps, including available land use and water quality data. No recycled water projects have been planned for these areas. It is likely that this approach would be maintained. In 2014 Valley Water prepared SNMPs for the Llagas and Santa Clara basins.

8.9.4. Permitting and Regulatory Process

The management actions included in this section are studies, plans, or ongoing programs that would be implemented within the existing authorities and water management functions of the GSAs and may not trigger permitting requirements. CEQA review is not required for planning studies. Actions to improve water quality by reducing pollutant loading would fall under the "common sense exemption" for CEQA review (CEQA Guidelines Section 15051(b)(3)) unless there were an ancillary activity such as disposal of brine concentrate from a demineralization facility.

8.9.5. Legal Authority

These actions are within the legal authority of SBCWD as described in the Introduction Section 1.4.

8.9.6. Project Benefits

Benefits would involve improved understanding of groundwater quality conditions and occurrence of constituents of concern, notably TDS and nitrogen. This in turn supports improved management, and maintenance of measurable objectives relative to TDS and nitrate. Benefits would accrue to the entire North San Benito community.

8.9.7. Estimated Costs and Financing

Consultant costs to develop a SNMP for North San Benito Basin are approximately $250,000. The remaining management actions may be handled within the general operations of SBCWD staff, with some issues potentially warranting more intensive investigation with use of consultants.

8.9.8. Status and Timeline

SNMP development would benefit from the next two triennial water quality updates and thus is planned for the second five-year period. It would require about two years to complete. The other management actions can start within the first five-year period with accrual of benefits as the programs are used.

8.10. Reduce Potential Impacts to GDEs

Previous sections of the GSP (Section 4.11, Interconnection of Surface Water and Groundwater, and Section 6.7, Depletions of Interconnected Surface Water) provide information on surface water-groundwater connections, identify potential GDEs (riparian vegetation and steelhead), discuss potential undesirable results, define a minimum threshold using groundwater levels as proxy, describe monitoring for GDEs, and discuss implementation of recommended actions to better quantify the relationship between groundwater levels and habitat conditions and to explore means to reduce potential impacts to GDEs. This section describes these recommended actions.

8.10.1. Description

The first recommended action involves installation of dedicated shallow monitoring wells to measure water table depth at locations where riparian vegetation might potentially be impacted by pumping. This was initiated in 2021 as part of this GSP. As described in **Appendix H**, six shallow monitoring wells have been sited at locations near the Pajaro River, Pacheco Creek, San Benito River (two sites), Paicines

Creek, and Tres Pinos Creek. The wells will be added to the overall water-level monitoring program, adding needed data on shallow groundwater levels.

The second recommended action is focused on steelhead trout migration. The San Benito River is identified as critical habitat for steelhead (as are other local streams), but documentation is lacking about fish passage, particularly along the San Benito River, which is broad and sandy along a substantial length of its lower reach in San Juan Valley. The recommendation is to conduct a field study to identify the critical riffle that limits fish passage opportunity along the San Benito River and estimate the minimum flow required to allow passage over the riffle.

Potential management actions to reduce potential impacts to GDEs will be based on existing information, water level data from existing and new monitoring wells, and studies such as the fish passage study. With regard to riparian vegetation, best available information indicates that the distribution and health of riparian vegetation shows little correlation with groundwater levels.

Steelhead smolt passage along the San Benito River appears to be the most sensitive aspect of interconnected surface water. Findings of the steelhead passage study will be fundamental to identifying and developing management actions to reduce potential impacts with details on how, where, and when an action is implemented. Pending results of that study, conceptual management actions for steelhead and riparian vegetation if impacts appear during droughts may include:

- Change land use designations, obtain conservation easements, or implement other land-use management measures designed to minimize future increases in groundwater pumping along the San Benito River upstream of the critical riffle that might reduce passage opportunity.
- Cooperate with other agencies to control invasive vegetation in riparian areas. Although this would benefit overall habitat conditions, it would not be a substitute for adequate flows.
- Restrict groundwater pumping near the critical riffle when San Benito River flow is receding through the minimum passage flow. This would be contingent on the results of the fish passage study and an evaluation of the expected benefits of short-term pumping reductions on base flow.
- In extreme drought conditions with evident and widespread mortality of riparian vegetation (which would only occur if the minimum threshold water levels for interconnected surface water are grossly exceeded), irrigate selected areas of riparian vegetation to provide ecological refugia and nuclei for riparian recovery following the drought.
- Site, design and operate groundwater recharge projects to have multiple benefits including aquatic/riparian habitat protection.

8.10.2. Project Implementation

The first and second management actions (installation of shallow monitoring wells and fish passage study) are intended to increase understanding of shallow groundwater conditions and potential undesirable results on GDEs. The usefulness of shallow monitoring wells is predicated on monitoring and data collection over many years, and thus the wells have already been installed and monitoring has been initiated. The monitoring will be ongoing as part of the Monitoring Network (Section 7). Assuming suitable hydrologic conditions, the San Benito River fish passage study can be completed during the first

5-year implementation period and thus support refinement of the interconnected surface water minimum threshold during the 5-year GSP update process.

8.10.3. Public and Agency Noticing and Outreach

Progress on the recommended management actions will be summarized in the Annual Reports.

8.10.4. Permitting and Regulatory Process

The permitting, regulatory process, and environmental review for installation of shallow monitoring wells will be summarized in the Well Drilling and Construction Technical Memorandum for the North San Benito Basin Dedicated Groundwater Monitoring Wells, which is being prepared in 2021.. The fish passage study requires no permitting, regulatory, or environmental review process. Evaluation of potential management actions similarly is a study; specific projects generated from it may require permitting and CEQA review.

8.10.5. Legal Authority

The legal authority of SBCWD is described in the Introduction Section 1.4.

8.10.6. Project Benefits

Improved monitoring of water table conditions in riparian areas will allow early detection of potential vegetation die-back or mortality during droughts. Although riparian vegetation suffered negligible impacts during the 2013-2015 drought, this information will improve preparedness for future droughts and help identify the most effective interventions if need for a response is indicated (nearby pumping reductions versus direct irrigation, for example). The fish passage study will contribute greatly to an understanding of whether groundwater pumping and levels have a significant impact on fish passage based on the location of the riffle with respect to reaches of the San Benito River that are interconnected with groundwater.

8.10.7. Estimated Costs and Financing

The cost of installing shallow riparian monitoring wells has already been covered by the SGMP Round 3 grant, although additional wells may be indicated in the future. A field study to identify the critical riffle along the San Benito River, estimate minimum passage flows for adult and juvenile steelhead, and apply the groundwater model to estimate groundwater pumping effects on passage flow duration would be approximately $20,000. Additional interventions during droughts might not be necessary, based on experience during previous droughts. If monitoring shows that action is needed, the GSAs will select the most appropriate action based on the location, type and severity of vegetation impacts.

8.10.8. Status and Timeline

Shallow riparian monitoring wells are being installed in 2021. The critical riffle study will be completed during the first five-year GSP implementation period.

8.11. Provide Long-term Basin-wide Funding Mechanisms

Groundwater sustainability necessitates the continuation of activities including monitoring, data compilation, data analysis, numerical model update, public outreach and annual reporting, five-year GSP updates, investigations, coordination with other agencies, and program administration. While the GSAs have conducted such activities, SGMA requirements are more comprehensive and rigorous. In addition, the extent of activities encompasses the entire North San Benito Groundwater Basin. Accordingly, this management action provides mechanisms for long-term, basin wide funding within the respective jurisdictions of the SBCWD and Valley Water GSAs.

Based on the legal authority provided by the 1953 San Benito County Water District Act (California Water Code Appendix 70) and by SGMA, SBCWD plans to implement two types of fees for the SBCWD portion of the Basin. The first is based on the acreage of parcels within the SBCWD portion of the Basin benefitting from SGMA management. This Groundwater Management Fee is the focus of this section. The second type of fee being planned is based on the volume of groundwater pumped by groundwater users. Currently no means exists for measuring property-specific groundwater pumping volumes across the entire Basin, so this method is planned for later implementation.

8.11.1. Description

The Groundwater Management Fee provides a mechanism for funding of sustainability planning and management across the entire North San Benito Basin; most of this discussion pertains to the San Benito County portion of the basin. The Santa Clara County portion includes 3,354 acres; the share of funding from this area will be addressed through agreement between SBCWD GSA and Valley Water GSA.

Implemented through Resolution No. 2021-13 of the SBCWD GSA Board of Directors, the Groundwater Management Fee has been based on best available information on 1) costs of preparing and implementing the GSP and 2) benefits to water agencies, cities, and landowners with parcels overlying the North San Benito Basin.

Analysis of costs for preparing and implementing the GSP has been based in part on review of existing costs for groundwater management (for example in SBCWD Zones 3 and 6) and evaluation of additional costs that account for the entirety of the basin and for SGMA requirements. Accordingly, cost analysis has addressed costs for GSP preparation, monitoring, data compilation, data analysis, numerical model update, public outreach, and annual reporting, five-year GSP updates, investigations, coordination with other agencies, and program administration.

Groundwater management, including GSP development and implementation, provides benefits for all landowners within the Basin that use groundwater for agriculture, landscaping, municipal, industrial, domestic, or environmental uses. However, parcels overlying the unconsolidated alluvial materials in valley areas have greater access to groundwater, while groundwater occurrence and beneficial uses are limited in the upland areas within the Basin. As described in Section 3, the valley areas represent productive portions of the Basin, consistent with the location of the Principal Aquifer and areas of the Secondary Aquifer in proximity to the Principal Aquifer. Upland areas within the Basin underlain by the Secondary Aquifer have less access to groundwater due to geologic and topographic factors.

An assessment of potential benefit from groundwater management and the development and implementation of a GSP has been completed on a parcel basis for the entire Basin. Parcels were categorized relative to location in upland areas of the Basin that have less access to groundwater and receive insignificant benefit from groundwater management and parcels within valley areas that represent the productive portions of the Basin that benefit from groundwater management and the development and implementation of a GSP. Parcels within the service areas of major municipal and industrial (M&I) water purveyors were identified. These parcels within the service areas of major M&I water purveyors have indirect access to benefits of groundwater management and are billed accordingly. A fee representing the benefits of groundwater management is appropriately directed to the water purveyor. The categorization of parcels within the Basin in San Benito County are categorized as follows:

- Areas Benefiting from GSP
- Upland Areas with Insignificant GSP Benefit
- Major Municipal and Industrial Areas, specifically:
    - City of Hollister Service Area
    - Sunnyslope County Water District Service Area
    - City of San Juan Bautista Service Area.

The area in Santa Clara County similarly can be addressed between the SBCWD GSA and Valley Water GSA in terms of:

- Areas Benefiting from GSP
- Upland Areas with Insignificant GSP Benefit.

8.11.2. Project Implementation

As established in Resolution No. 2021-13, the Groundwater Management Fee will be charged on the basis of land acreage. All property within the San Benito portion of the Basin will be charged the Fee, except lands classified as Upland Areas with Limited GSP Benefit. The fees are implemented for fiscal year 2021-22 through fiscal year 2025-26. The SBCWD GSA Board of Directors will annually review the fee and perform a comprehensive review every five years, with at least one public meeting.

8.11.3. Public and Agency Noticing and Outreach

Outreach to the public and agencies has included website announcements, mailers, and public presentations, including TAC meetings (November 4, 2020, and January 27, 2021), a well-attended public workshop (March 10, 2021), and public Board meetings. Meeting agenda and presentations are posted on the SBCWD website.

The SBCWD GSA Board of Directors convened a July 14, 2021 hearing to discuss the resolution to adopt the Groundwater Management Fee. This hearing was duly noticed pursuant to the requirements of Water Code section 10730(b). The GSA provided notice of the time and place of the public meeting at which the Groundwater Management Fee was considered; the notice was published in compliance with Government Code section 6066, was posted on the GSA's website, and mailed to interested parties. The

date was made available to the public at least 20 days before the meeting, the GSA held the public meeting, and permitted written and oral presentations from the public.

The General Manager of the San Benito County Water District is authorized and directed to notify the California Public Utilities Commission (CPUC) of the Groundwater Management Fee by way of letter to the Director of the Water Division. SBCWD GSA also will furnish to the County Auditor-Controller and Board of Supervisors, on or before August 1 of each year for which collection of the Fee is requested, a copy of the resolution requesting collection together with the list of parcels and the amount to be collected for each parcel.

As indicated in the Resolution, a person may file a protest with the GSA and have an opportunity to discuss the basis of the appeal. SBCWD GSA will make a determination in writing and the person also may appeal to the SBCWD GSA Board of Directors.

8.11.4. Legal Authority

Both SBCWD and Valley Water have existing authorities to provide for funding of management activities, as provided in their respective legislation as special districts (see Introduction Section 1.4). In addition, the Sustainable Groundwater Management Act, specifically Water Code section 10730(a), authorizes a GSA to impose fees to fund the costs of a groundwater sustainability program, including, but not limited to, preparation, adoption, and amendment of a groundwater sustainability plan, and investigations, inspections, compliance assistance, enforcement, program administration, and a prudent reserve.

8.11.5. Project Benefits

The benefits of the fee are to provide funding support for sustainable groundwater management across the entire North San Benito Basin. As documented throughout the GSP, sustainable groundwater management provides benefits for all landowners within the Basin, based on compliance with SGMA, monitoring of groundwater conditions, projects, and management actions to sustain groundwater, and regular reporting to stakeholders and the community about the sustainability of North San Benito water supplies. The Groundwater Management Fee assessment recognizes a basic differentiation at this time of benefits to parcels overlying productive valley areas with greater access to groundwater and upland areas where groundwater occurrence and beneficial uses are limited. Benefits will be considered as the SBCWD GSA Board of Directors annually reviews the fee, with a comprehensive review every five years.

8.11.6. Estimated Costs and Financing

The cost of developing funding measures has been included in costs of GSP preparation, and implementation will be funded by the Groundwater Management Fee. In its Resolution No. 2021-13, the SBCWD GSA Board of Directors has determined that the amount of the Groundwater Management Fee is no more than necessary to cover the reasonable costs of the governmental activity financed thereby and that the manner in which those costs are allocated to landowners charged with the Groundwater Management Fee bears a fair and reasonable relationship to the owners' benefits received from management of the Basin.

As stated in Resolution No. 2021-13 and Attachment A of the resolution, the SBCWD GSA has identified the total costs of GSP preparation and the expected annual management and administration

costs over the next five years, that the GSA adopts and levies and provides for the collection of the Groundwater Management Fee:

Table 8-3. Total GSP Plan Development and Annual Expense

Fiscal year	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
Total Expense	$525,935	$539,401	$553,271	$567,557	$582,272

8.11.7. Status and Timeline

In 2021, the SBCWD GSA has identified the total costs of GSP preparation and the expected annual management and administration costs over the next five years and has developed the Groundwater Management Fee to fund the costs of a groundwater sustainability program, including preparation and amendment of a GSP and the ongoing activities to sustain the GSP effort. Implementation of the Groundwater Management Fee is slated for implementation in 2021 and planned with annual review by the SBCWD GSA Board of Directors and five-year comprehensive review.

8.12. Provide GSP Administration, Monitoring and Annual Reporting

For decades, SBCWD has provided groundwater basin management focused mostly on Zone 6 and Zone 3. Since 2014, the two GSAs have participated actively in SGMA including development of their MOU for preparation of the GSP. SBCWD, with the cooperation of SCVWD (Valley Water), also has secured DWR SGM funding to develop the GSP, and successfully applied for a basin boundary modification to consolidate previously defined basins and to create the North San Benito Groundwater Basin. Current efforts include expansion of monitoring and reporting to encompass the entirety of the new basin.

Administrative actions described in this section include (but are not limited to) GSA update of their MOU to address GSP implementation and likely cooperation to secure additional funding. This management action also should include additional review of basin boundaries. This recognizes that the basis of existing boundaries remains uncertain and that modified boundaries could increase the effectiveness of projects and management actions.

The Annual Groundwater Report has been prepared at the direction of the Board of Directors to fulfill the requirements set forth in SBCWD's formation act (California Water Code Appendix 70). This Annual Groundwater Report has addressed most but not all the area now encompassed in the North San Benito Groundwater Basin. Appendix 70 requires preparation of the report (summarizing the water year October 1 through September 30) in December and presentation to the Board of Directors in January. Appendix 70 states that the annual report will provide documentation of groundwater levels and pumping, groundwater storage change, and overdraft (if any); an estimate of next-year conditions, agricultural pumping and water purchases; and the required recommendations for surface water deliveries, groundwater replenishment, and groundwater charges. In recent years, Annual Reports have

been prepared with triennial updates on water budgets and on water quality conditions, and planning for the transition to SGMA compliance.

8.12.1. Description

Overall, this management action provides the ongoing GSP Administration by the GSAs, the monitoring and annual reporting to maintain sustainable management planning and compliance with SGMA. The monitoring network is described in Section 7, while improvements to the monitoring programs and DMS are described in Section 8.7.

The GSP Regulations (§ 356.2) regarding annual report preparation are extensive and relatively detailed and include annual reporting on sustainability conditions, including water quality, subsidence, and GDEs which are not currently reported on an annual basis. GSP requirements for annual report contents are summarized below:

- **General information**, including executive summary and location map.
- **Groundwater elevation** data including contour maps for seasonal high and low, hydrographs of groundwater elevations and water year type.
- **Groundwater extraction** for the preceding water year in a table by water use sector, identifying method and accuracy of measurements, and a map that illustrates general location and volume of groundwater extractions.
- **Surface water supply** used or available for groundwater recharge or in-lieu use, with annual volume and sources for the preceding water year.
- **Total water use** reported in a table by water use sector and water source type, identifying the method and accuracy of measurements. Existing water use data from the most recent UWMP/AWMP may be used, reported by water year.
- **Change in groundwater in storage** shall including change in storage maps, graph with water year type, groundwater use, annual change in groundwater in storage, and the cumulative change in groundwater in storage.
- A description of **progress implementing the GSP** since the previous annual report.

While historical Annual Groundwater Reports have had a focus on SBCWD Zone 6, SGMA requires that the Annual Report address the entire North San Benito Basin, including the small areas in Valley Water.

8.12.2. Project Implementation and Timeline

Annual monitoring and reporting are ongoing. While previously prepared solely at the direction of the SBCWD Board Project, future annual reporting will include technical information as previously provided with some adjustment to provide Appendix 70 financial information and recommended groundwater charges on an earlier schedule. Annual Reports will be prepared to summarize water resource conditions and management actions as of the preceding water year. Relative to historical practice, the schedule will be shifted to the schedule for GSP Annual Reports, which have an April 1 deadline.

Preparation of Annual Groundwater Reports typically have been a joint effort of SBCWD staff and a consultant team. Other cooperating agencies (including City of Hollister, SSCWD, City of San Juan Bautista, Tres Pinos Water District, Valley Water, and San Benito County) provide data.

8.12.3. Public and Agency Noticing and Outreach

The Annual Groundwater Report will be presented as a draft to the TAC and their comments and questions will be addressed. Similar to past practice, the Annual Report will be presented to the SBCWD Board of Directors at a duly noticed public meeting. The Annual Reports have been and will continue to be uploaded to the SBCWD website. The procedures for Annual Report delivery to the Valley Water GSA Board of Directors will be included in a MOU developed by the two GSAs for implementation of the GSP. The Annual Report will be submitted by April 1 of each year via the DWR online portal and thereby posted on the DWR website.

8.12.4. Permitting and Regulatory Process

This management action is a SGMA requirement. As an Annual Report, no permitting or regulatory processes are involved.

8.12.5. Legal Authority

The legal authorities of SBCWD GSA and Valley Water GSA are described in the Introduction Section 1.4.

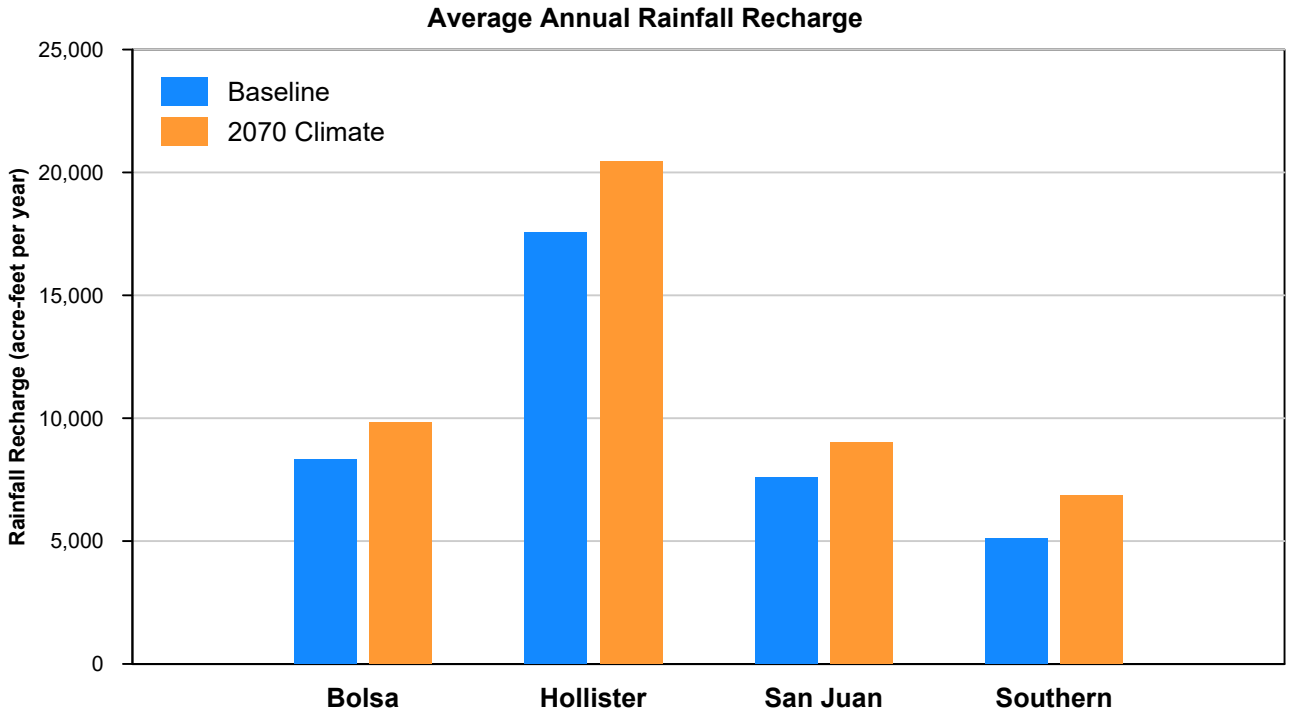
8.12.6. Project Benefits

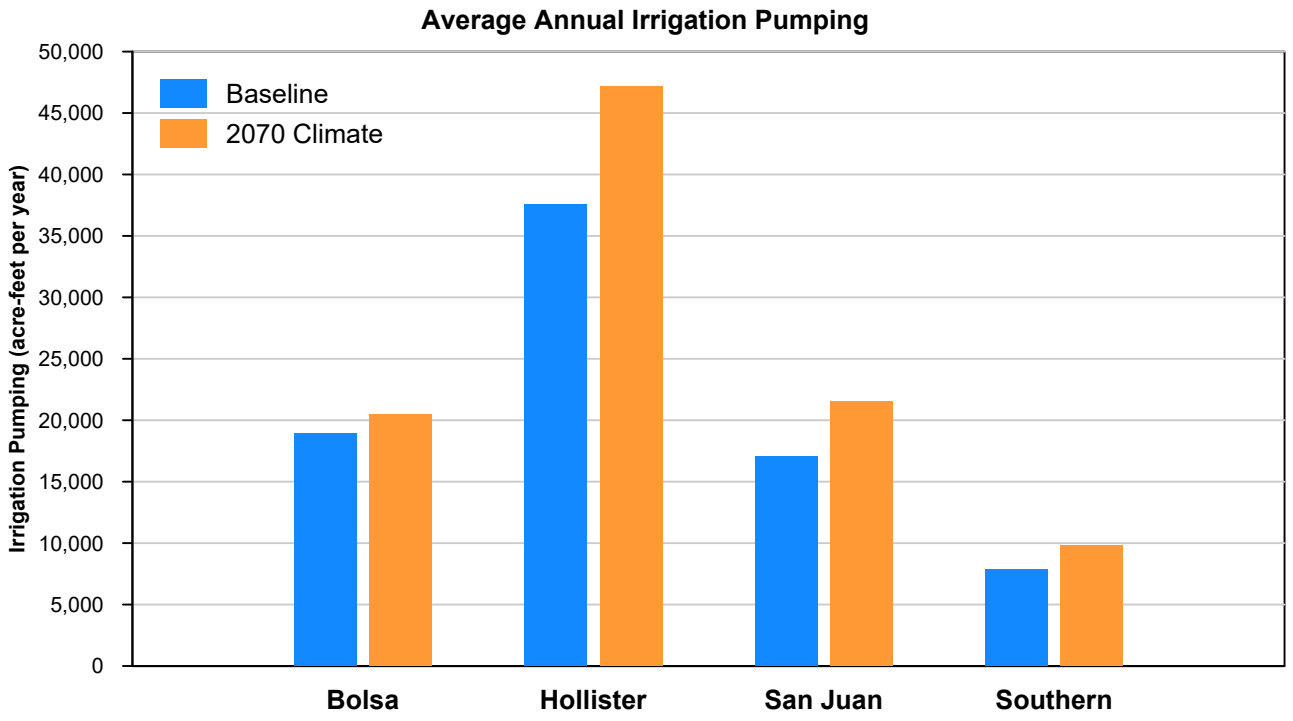
Benefits of the Annual Reports involve communication of the “state of the basin” to decision makers, other agencies, stakeholders, and the public. Annual reporting helps guide management of groundwater resources in conjunction with surface water supplies. Benefits accrue to the community of the entire North San Benito Basin and are pertinent to all measurable objectives.

8.12.7. Estimated Costs and Financing

Annual report preparation has been and is a required and integral part of GSP preparation and implementation. Preparation of three Annual Reports (2017, 2018, and 2019) was included as part of the Sustainable Groundwater Planning (SGWP) Grant Agreement between DWR and SBCWD (Agreement Number 4600012676) and preparation of the 2020 and 2021 Annual Reports was part of the Amendment #1 to that Agreement. In all cases, preparation of the Annual Reports represented SBCWD cost share.

The estimated annual cost for consultant assistance to SBCWD for annual report preparation is approximately $100,000 per year for the next five years. Future costs can be covered through the Groundwater Management Fee (see Section 8.11).





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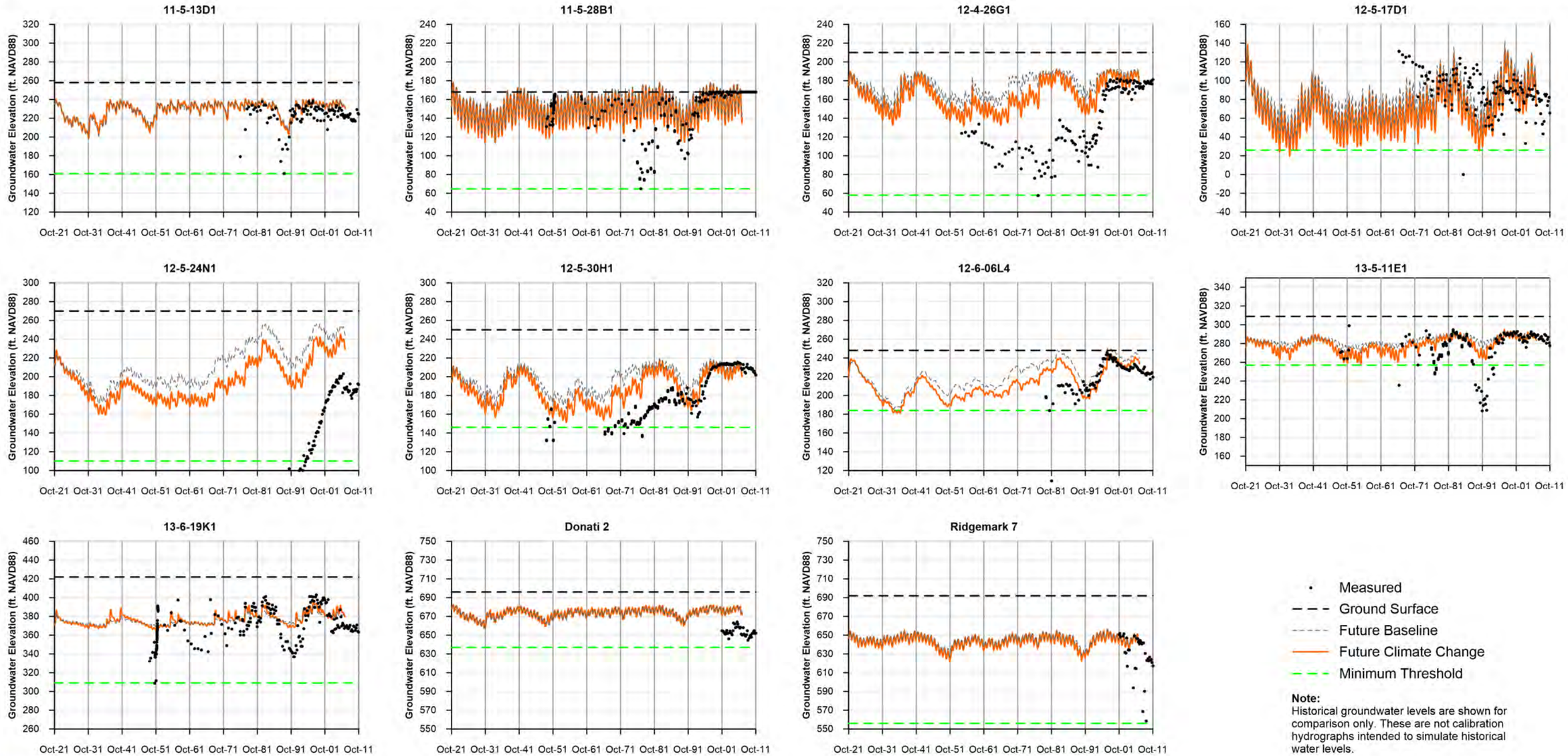
November 2021

TODD GROUNDWATER

Figure 8-1
Effect of Climate Change on Recharge and Pumping

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure 8-1 Effect of Climate Change on Recharge and Pumping.gpj



Note:
Historical groundwater levels are shown for comparison only. These are not calibration hydrographs intended to simulate historical water levels.

Data:
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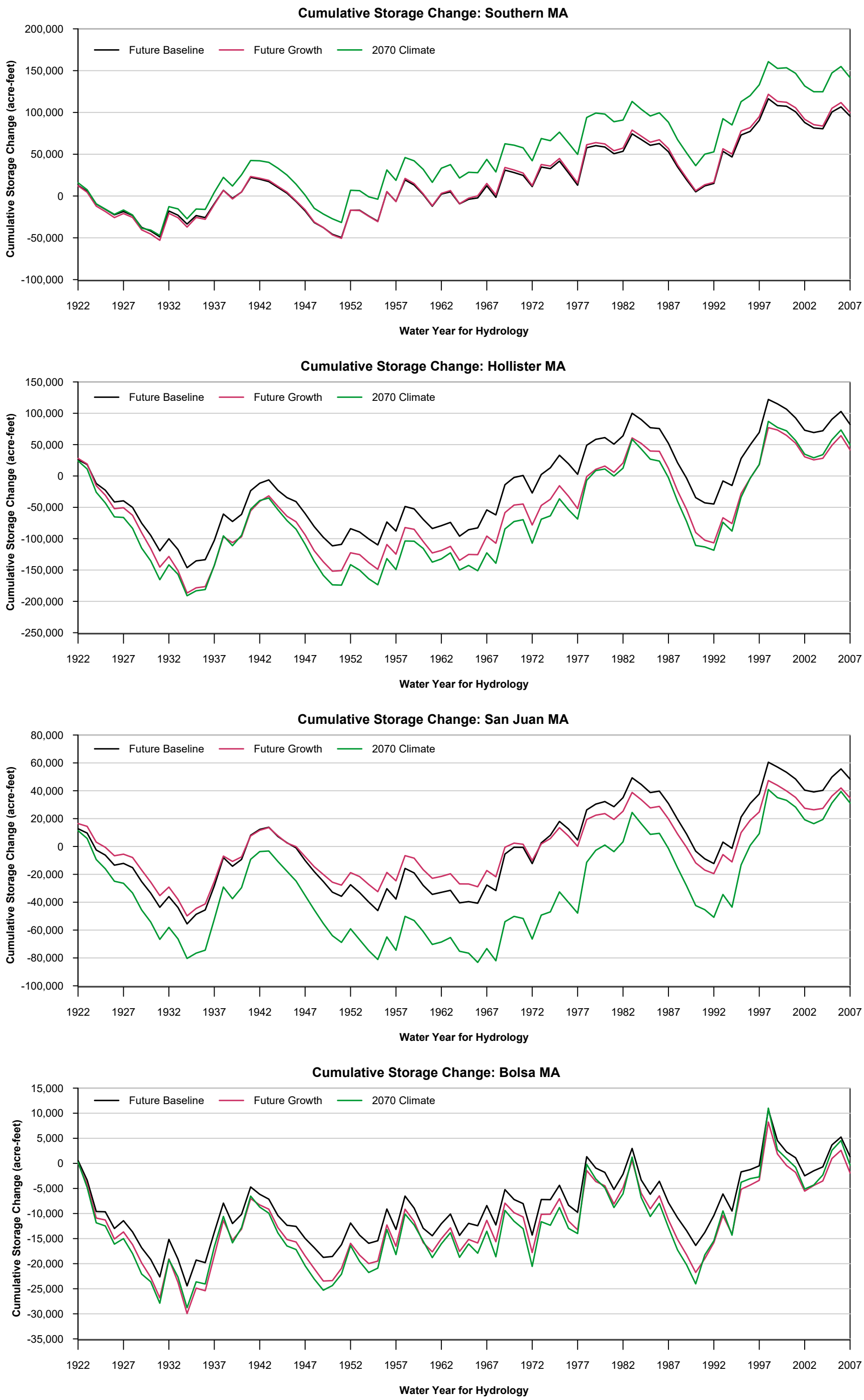
November 2021

TODD GROUNDWATER

Figure 8-2
Climate Change Hydrographs



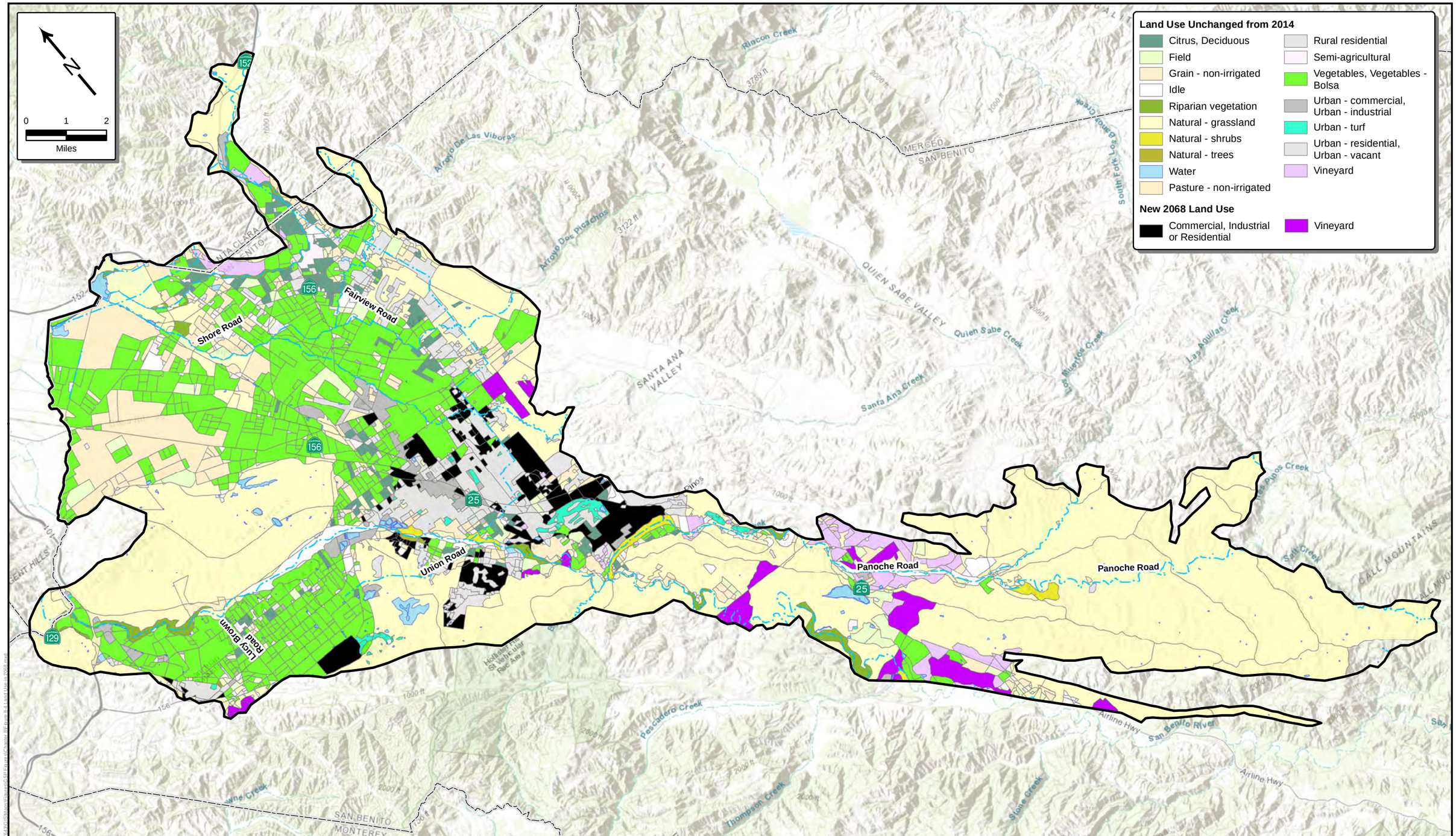
November 2021

TODD GROUNDWATER

Figure 8-3
Cumulative Storage Changes Under Baseline, Growth and Climate Change Scenarios

Data:
T:\Projects\San Benito GSP 37643\Model_1922-2007\GWV\ZBout_1922-2007_growth_&_climate.xlsx Cumulative Storage Fig

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure 8-3 Cumulative Storage Change.gpj



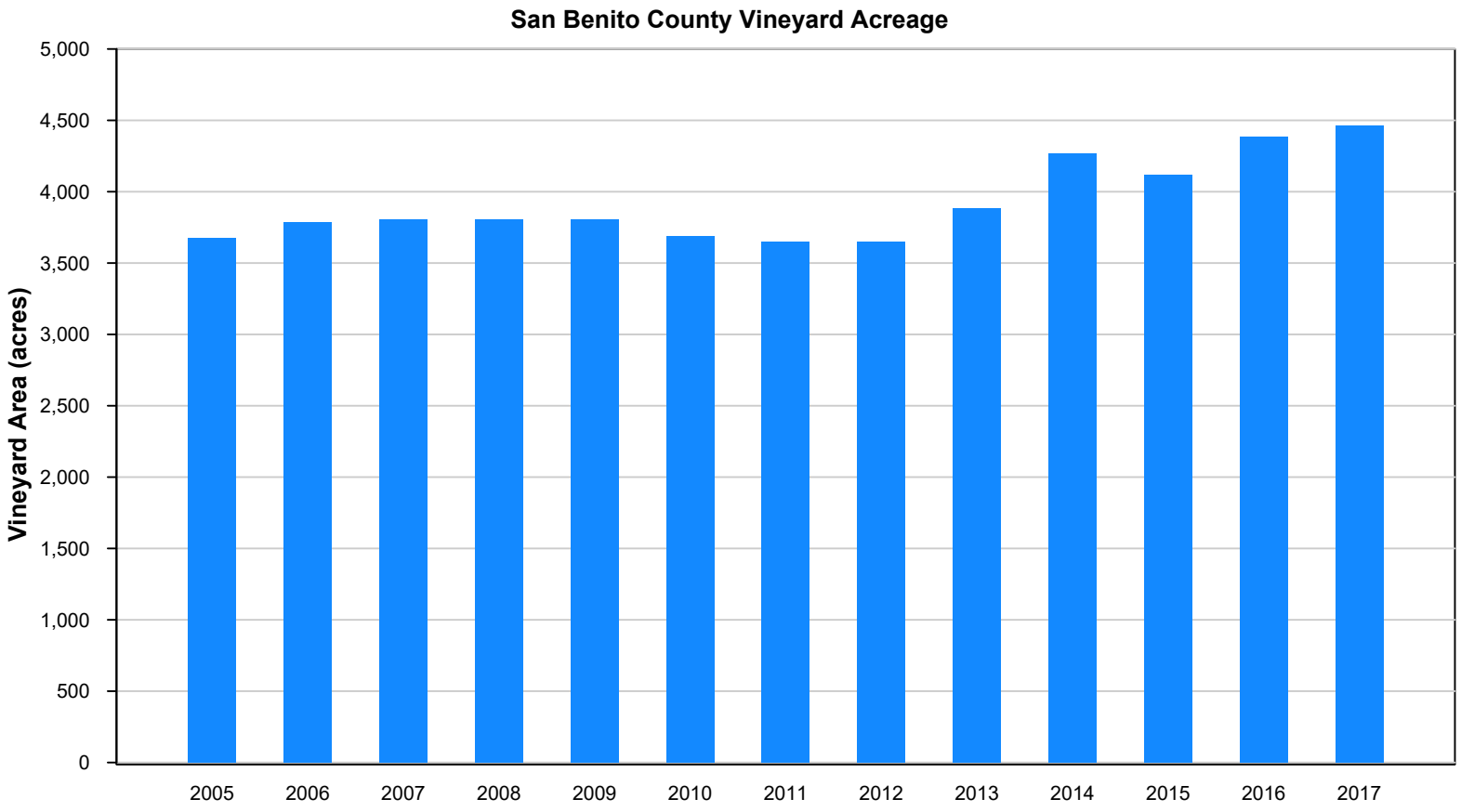
North San Benito Basin

San Benito County

November 2021

TODD GROUNDWATER

Figure 8-4
Land Use in 2068



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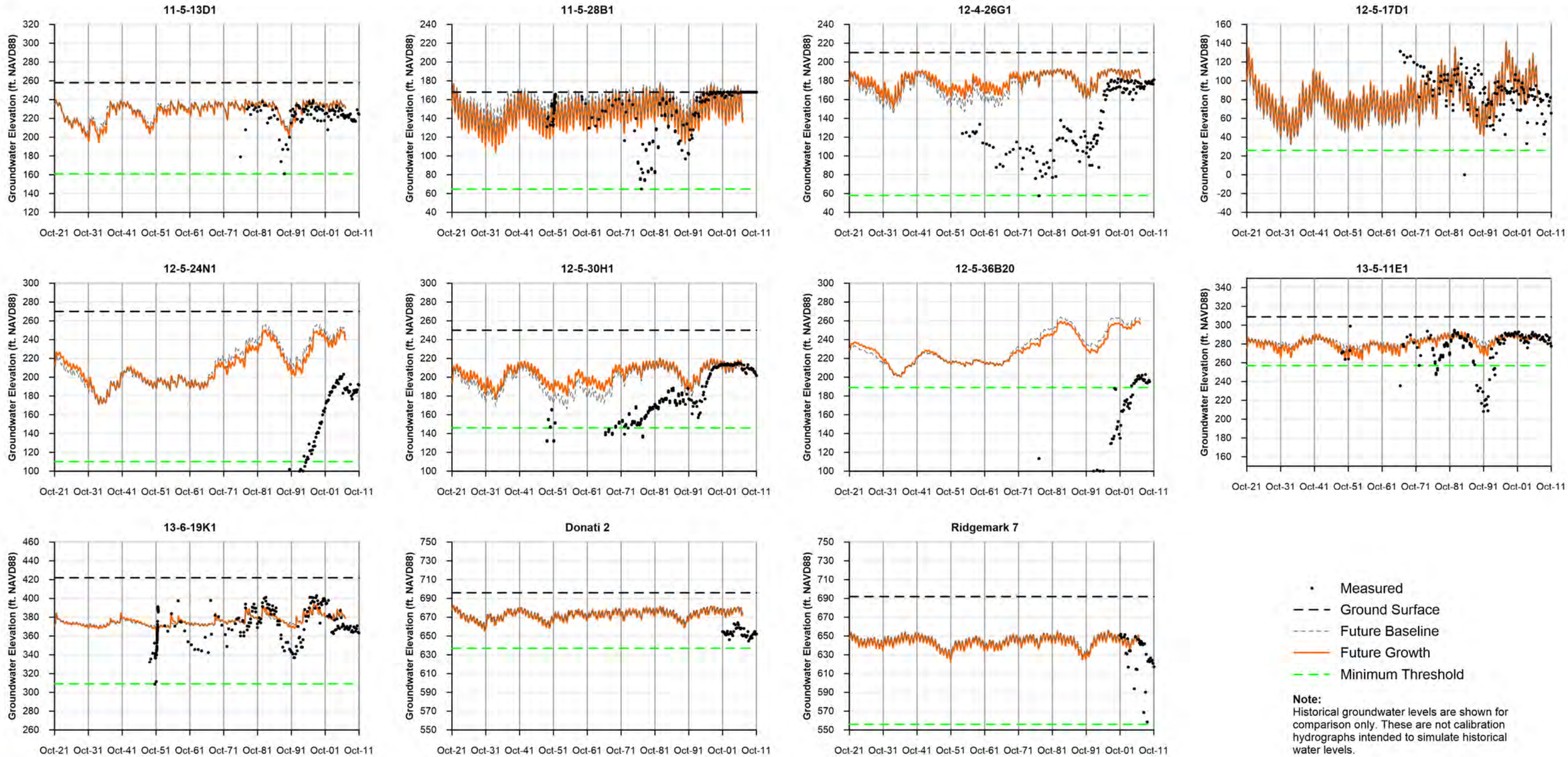
November 2021

TODD GROUNDWATER

Figure 8-5
Vineyard Acreage
2005-2017

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure 8-5 Vineyard Acreage 2005-2017.gpj



Note:
Historical groundwater levels are shown for comparison only. These are not calibration hydrographs intended to simulate historical water levels.

Data:
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November 2021

TODD GROUNDWATER

Figure 8-6
Future Growth Hydrographs

9. IMPLEMENTATION PLAN

While the North San Benito Groundwater Basin is considered to be sustainably managed, this status is by no means taken for granted. Potential effects of growth, land use change, and climate change have been evaluated by means of modeling simulations, but effects are likely to be cumulative, and thereby present challenges to sustainability. Accordingly, additional projects and actions must be continued or implemented to satisfy the Sustainability Goal to the foreseeable planning horizon. This Groundwater Sustainability Plan (GSP) implementation period begins in 2022 and continues until 2042.

9.1. PROJECTS AND MANAGEMENT ACTIONS

Projects and Management Actions are described in Section 8, each in terms of technical description, feasibility and implementation, benefits, costs and financing, and timeline. The Projects and Management Actions are listed below in the same order as presented in Section 8.

Projects

- Develop Surface Water Storage (Pacheco Reservoir Expansion Project)
- Expand Managed Aquifer Recharge (MAR)
- Enhance Conjunctive Use
  - Hollister Urban Area Water and Wastewater Project
  - City of San Juan Bautista Regional Water and Wastewater Solution
  - North County Project
  - Zone 3 Operations Planning Tool
- Enhance Water Conservation.

Management Actions

- Improve Monitoring Program and Data Management System (DMS)
  - Measure agricultural groundwater extraction
  - Improve monitoring well network and DMS
  - Improve water quality monitoring program
  - Enhance surface water gaging
- Develop Response Plans
- Enhance Water Quality Improvement Programs
- Reduce Potential Impacts to Groundwater Dependent Ecosystems (GDEs) (Steelhead and Riparian Vegetation)
- Provide Long-term Basin-wide Funding Mechanism
- Provide GSP Administration, Monitoring, and Reporting.

The projects and management actions described here work together toward the sustainability goal and objectives, namely: to provide a reliable and efficient groundwater supply, to provide reliable storage, to protect groundwater quality, to prevent subsidence, to support beneficial uses of interconnected surface waters, and to support integrated and cooperative water resource management. The foremost element is to secure Central Valley Project (CVP) supplies, despite variations in its annual availability,

and to store CVP water in the groundwater basin for use in drought and shortage. This is fundamental to avoiding undesirable results and overdraft.

9.1.1. Timeline

Table 9-1 is an estimated timeline for implementation. The timeline columns include the individual years 2021 through 2025, which are followed by five-year intervals to 2040-2045. With implementation officially starting in 2022, the last interval includes the 2042 deadline for the 20-year implementation to achieve the sustainability goal.

Table 9 1. Estimated Timeline for Projects and Management Actions

Description	GSP Implementation Period								
	2021	2022	2023	2024	2025	2026-2030	2031-2035	2036-2040	2041-2045
Projects									
Pacheco Reservoir Expansion Project									
Planning									
Construction									
Benefits									
Managed Aquifer Recharge (MAR) Project									
Planning									
Construction									
Benefits									
Hollister Urban Area Water/Wastewater Master Plan									
San Juan Bautista Regional Water/Wastewater Solution									
Planning									
Construction				(to be determined)					
Benefits					(to be determined)				
North County Project (phased)									
Planning									
Construction									
Benefits									
Zone 3 Operations Planning Tool (ongoing benefits)									
Water Conservation (ongoing with accrual of benefits)									
UWMPs and AWMPs									
Management Actions									
Improve Monitoring Program and DMS									
Establish Measurement of Agricultural Extraction									
Planning									
Implementation									
Benefits									
Improve Network and DMS									
Install dedicated monitoring wells									
Document wells, develop inventory, enhance DMS									
Improve Water Quality Monitoring									
Install Surface Water Gage									
Develop Response Plans									
Water Quality Improvement Programs									
Ongoing agency cooperation and outreach									
Additional analyses of salt balance									
Update SNMP									
Reduce Potential Impacts to GDEs									
Install Shallow Monitoring Wells									
Steelhead Passage Study			(to be determined)						
Provide Long-term Basin-wide Funding Mechanism									
Establish Groundwater Management Fee									
Establish Groundwater Extraction Fee									
Annual Administration, Monitoring, Reporting									
Five-Year Update									

The Projects, Management Actions, and GSP Administration, Monitoring, and Reporting are listed in rows and as warranted, major phases are indicated in terms of planning, construction, and accrual of benefits. As shown, most projects and management actions have been ongoing. Some have been initiated as part of this GSP preparation.

In general, the Projects are shown as independent efforts without dependency or other relationships. However, the Hollister Urban Area Water/Wastewater Master Plan has been ongoing since 2004 and has been a major coordination effort guiding water, wastewater, and recycled water projects and programs in the Hollister area. This effort has supported other listed projects such as the North County Project and water conservation. It has provided facilities (most notably water treatment plant construction and improvements) that are necessary for listed projects currently being planned such as Managed Aquifer Recharge and the San Juan Bautista regional solution. As another interconnection, the North County Project (which involves planning for new production wells in Hollister MA) is being considered in coordination with Managed Aquifer Recharge, which presents opportunities for ASR operations for new wells.

The Management Actions involve important interdependencies as summarized below:

- **Measure Agricultural Groundwater Extraction.** This action is needed not only for GSP Administration, Monitoring and Reporting, but also is planned as a basis to provide a long-term basin-wide funding mechanism, specifically to establish a groundwater extraction fee.
- **Improve Monitoring Program and DMS.** These actions (installation of dedicated monitoring wells, documentation of wells, DMS enhancement) provide a basin-wide framework for monitoring and reliable data that support the evaluation of all projects and actions affecting groundwater levels and quality.
- **Install Dedicated Monitoring Wells.** Specifically, installation of shallow monitoring wells is critical to tracking interconnected surface water and reducing potential impacts to GDEs.
- **Install Surface Water Gage.** Improved surface water gaging supports tracking interconnected surface water and could support refinement of the Zone 3 Operations Planning Tool.
- **Improve Water Quality Monitoring.** This is needed to support water quality improvement programs, including preparation of an updated SNMP.
- **Provide Long-Term Basin-Wide Funding Mechanism.** This is needed to support monitoring, improvements to the monitoring programs and DMS, annual reporting, and overall administration.

9.1.2. Roles and Responsibilities

All projects and management actions are implemented by San Benito County Water District Groundwater Sustainability Agency (SBCWD GSA) within its San Benito County jurisdiction, with the collaboration of Valley Water GSA in Santa Clara County, and with the cooperation of other local agencies and organizations. As described in Section 8, implementation of this GSP is coordinated with other projects and programs.

9.1.3. Summary of Funding Sources

Sources of funding have and will continue to vary according to the project or management action (see Section 8).

Funding for planning and implementation of projects and some management actions (e.g., installation of monitoring stations) will be achieved with local, state, and federal sources. The local agencies track opportunities for outside financing (grants or loans) from state water programs and federal infrastructure funding. For local financing, the agencies update their financial plans and rates as needed.

For ongoing administration, monitoring, reporting and some management actions, SBCWD is implementing a Groundwater Management Fee. To track groundwater extraction, SBCWD is planning a Groundwater Extraction fee based on the volume of groundwater pumped by groundwater users. The Santa Clara County basin portion of funding will be addressed through agreement between SBCWD GSA and Valley Water GSA.

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San Benito County Water District GSA

Valley Water

North San Benito

Groundwater Sustainability Plan

November 2021

APPENDICES

TODD GROUNDWATER

APPENDIX A

SBCWD Notices of Decision to become a Groundwater Sustainability Agency

BOARD OF DIRECTORS
SAN BENITO COUNTY WATER DISTRICT
Agenda for
February 8, 2017
Special Meeting – 5:00 p.m.
30 Mansfield Road, Hollister, CA 95023

Speakers will be limited to 5 minutes to address the Board

Assistance for those with disabilities: If you have a disability and need accommodation to participate in the meeting, please call Barbara Mauro, Board Clerk, at (831) 637-8218 for assistance so the necessary arrangements can be made.

CALL TO ORDER

a. Pledge of Allegiance

b. Speakers will be limited to 5 minutes to address the Board

AGENDA ITEMS:

1. Public Hearing regarding the District's Decision to become the Groundwater Sustainability Agency for the Bolsa, Hollister and San Juan Subbasins within San Benito County

    a. Proof of Publication submitted for Notice of Public Hearing

    b. Presentation of Groundwater Sustainability Agency

    c. Open Public Hearing

    d. Close Public Hearing

    e. Consider Resolution for San Benito County Water District's Decision to become the Groundwater Sustainability Agency for the Bolsa, Hollister and San Juan Subbasins within San Benito County

ADJOURNMENT

All public records relating to an agenda item on this agenda are available for public inspection at the time the record is distributed to all, or a majority of all, members of the Board. Such records shall be available at the District office located at 30 Mansfield Road, Hollister, California.

BOARD OF DIRECTORS
SAN BENITO COUNTY WATER DISTRICT

RESOLUTION NO. 2017-03

A RESOLUTION OF THE BOARD OF DIRECTORS SAN BENITO COUNTY WATER DISTRICT'S DECISION TO BECOME THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE BOLSA, HOLLISTER, AND SAN JUAN SUBBASINS WITHIN SAN BENITO COUNTY

WHEREAS, on September 16, 2014, the Sustainable Groundwater Management Act (SGMA) was signed into law and adopted into the California Water Code, commencing with Section 10720; and

WHEREAS, the legislative intent of SGMA is to provide for the sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management; and to provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, Water Code Sections 10725 et al. and 10726 et al. detail additional new powers and authorities granted to Groundwater Sustainability Agencies to implement sustainable groundwater management in the basins under their jurisdictions; and

WHEREAS, the San Benito County Water District Act (California Water Code Appendix, Chapter 70) provides the District with broad groundwater management authority, including the authority to conserve water for beneficial and useful purposes by spreading, storing, retaining, and causing such waters to percolate into the soil within or without the District; and

WHEREAS, the District's statutory boundary overlies the Bolsa, Hollister, and San Juan Subbasins within San Benito County; and

WHEREAS, the Bolsa, Hollister, and San Juan Subbasins are deemed by the California Department of Water Resources (DWR) to be medium-priority basins and therefore require the development of a Groundwater Sustainability Plan; and

WHEREAS, establishing the District as the Groundwater Sustainability Agency will enable the District to prepare and implement a Groundwater Sustainability Plan (GSP) for the Bolsa, Hollister, and San Juan Subbasins within San Benito County, and to best work with DWR and the State Water Resources Control Board to resolve groundwater and surface water issues related to the Bolsa, Hollister, and San Juan Subbasins within San Benito County; and

WHEREAS, the District is committed to its legislatively created mandate to manage the surface water and groundwater resources within its jurisdiction; and

WHEREAS, prior to adopting a resolution of intent to establish the District as a Groundwater Sustainability Agency, Water Code Section 10723 requires the local agency to hold a public hearing, after publication of notice pursuant to California Government Code Section 6066, on whether or not to adopt a resolution to establish a Groundwater Sustainability Agency; and

WHEREAS, pursuant to Government Code 6066, notices of a public hearing on whether or not to adopt a resolution to establish a Groundwater Sustainability Agency were published on January 27, 2017 and February 3, 2017; and

WHEREAS, on February 8, 2017, this District held a public hearing regarding the adoption of a resolution to establish the District as the Groundwater Sustainability Agency for the Bolsa, Hollister, and San Juan Subbasins within San Benito County;

NOW, THEREFORE BE IT RESOLVED that the Board of Directors of the San Benito County Water District:

1. Hereby establishes the District as the Groundwater Sustainability Agency for the Bolsa, Hollister, and San Juan Subbasins within San Benito County; and

2. Hereby authorizes the District Manager or his designee to provide a copy of this resolution and a Notice of Intent to the California Department of Water Resources within 30 days and to otherwise comply with the requirements of Water Code Section 10723.B(a); and

3. All the recitals in this Resolution are true and correct and the District so finds, determines, and represents.

PASSED AND ADOPTED at a Special Meeting of the Board of Directors of San Benito County Water District by the following vote on February 8, 2017:

AYES: Tobias, Tonascia, Bettencourt, Flores & Huenemann
NOES: None
ABSENT: None
ABSTAIN: None

John Tobias
President

ATTEST:

Sara Singleton
Assistant Manager

APPENDIX B

Memorandum of Understanding

DOCUMENT #

MOU 00150

MEMORANDUM OF UNDERSTANDING BETWEEN SANTA CLARA VALLEY WATER DISTRICT AND SAN BENITO COUNTY WATER DISTRICT FOR SUSTAINABLE GROUNDWATER MANAGEMENT ACT COMPLIANCE

THIS MEMORANDUM OF UNDERSTANDING ("MOU"), made in the State of California on July 5, 2017, is by and between the Santa Clara Valley Water District ("SCVWD"), and the San Benito County Water District ("SBCWD"), each a "Party" and collectively the "Parties."

This MOU sets forth the respective roles and responsibilities of the Parties regarding coordination to sustainably manage groundwater in the Hollister Area Subbasin and San Juan Bautista Area Subbasin.

RECITALS

WHEREAS, the SCVWD, an independent special district created by the Legislature of the State of California, manages groundwater and is the primary water resource agency for Santa Clara County, supplying wholesale water, providing flood protection and serving as environmental steward for clean, safe creeks and healthy ecosystems; and

WHEREAS, the SBCWD, a water conservation and flood control district, preserves the economic and environmental health and well-being of San Benito County through the control, management and conservation of waters and the provision of water services in a practical, cost-effective and responsible manner; and

WHEREAS, the Sustainable Groundwater Management Act ("Act"), enacted by the State of California, provides that local agencies may become a Groundwater Sustainability Agency ("GSA") and adopt a Groundwater Sustainability Plan ("GSP") to manage groundwater basins within the local agency's statutory jurisdiction; and

WHEREAS, the Act and this MOU define "basin" as a basin or subbasin identified and defined in California Department of Water Resources (DWR) Bulletin 118; and

WHEREAS, the Act requires that the entirety of each medium- and high-priority basin, as defined by DWR, be covered by a GSA by June 30, 2017 to avoid potential state intervention; and

WHEREAS, the service area of each Party overlies two common groundwater basins as defined by the Act and DWR: the Hollister Area Subbasin (DWR Basin 3-3.03) and the San Juan Bautista Area Subbasin (DWR Basin 3-3.04), collectively the "Common Basins"; and

WHEREAS, the SBCWD manages groundwater within San Benito County, including the majority of the Common Basins and the entirety of the Bolsa Area Subbasin (DWR Basin 3-3.02); and

WHEREAS, small portions of the Common Basins are located within Santa Clara County; and

WHEREAS, in terms of surface area, Santa Clara County contains less than ten percent of the Hollister Area Subbasin and less than one percent of the San Juan Bautista Area Subbasin; and

WHEREAS, the SCVWD has not previously conducted groundwater management activities in the Santa Clara County portions of the Common Basins other than permitting the construction, modification, and destruction of wells; and

WHEREAS, following a public hearing on February 8, 2017, the SBCWD Board of Directors adopted Resolution 2017-03 establishing the SBCWD as the GSA for the portions of the Common Basins located within San Benito County; and

WHEREAS, following a public hearing on June 13, 2017, the SCVWD Board of Directors adopted Resolution 17-38 establishing the SCVWD as the GSA for the portion of the Common Basins in Santa Clara County; and

WHEREAS, the action of each Party to adopt a resolution to become the GSA and submit related notification to DWR ensures the entirety of the Common Basins is covered by a GSA with no areas of overlap; and

WHEREAS, each Party is a local agency qualified to prepare and adopt a GSP under the Act; and

WHEREAS, the entirety of each basin subject to the Act that is not in a condition of critical overdraft must be addressed by a GSP by January 31, 2022; and

WHEREAS, if there are multiple GSAs within a basin, the GSAs can develop a single GSP for the entire basin or separate GSPs, provided there is a related coordination agreement; and

WHEREAS, for the purposes of this MOU, "GSP" is defined as one or more GSPs developed by the Parties for the entirety of the Common Basins; and

WHEREAS, GSAs are responsible for ensuring long-term groundwater sustainability through implementation of a GSP; and

WHEREAS, the Parties wish to provide a framework for cooperative groundwater management efforts in the Common Basins to ensure the Act is implemented effectively, efficiently, fairly, and at the lowest reasonable cost.

NOW, THEREFORE, in consideration of the recitals and mutual obligations of the Parties expressed herein, the Parties agree as follows:

1. Purpose

The purpose of this MOU is to establish an understanding between the Parties with regard to preparing a GSP for the Common Basins, including responsibilities and funding obligations.

2. Term

a) This MOU shall become effective upon its execution by both Parties.

b) This MOU will terminate when the Parties agree, in writing, that the GSP is complete to the satisfaction of DWR.

c) Payment obligations under Article 6, Cost Sharing and Payment, and Article 11, Cancellation, shall survive discharge or termination of this MOU until obligations are satisfied.

3. Responsibilities of the Parties

General responsibilities of the Parties regarding the Common Basins are as follows:

a) Ensure all required GSA filings are complete and submitted to DWR by the June 30, 2017 statutory deadline.

b) Develop a schedule to prepare a GSP for the Common Basins for consideration by the Board of Directors of both Parties.

c) Share relevant data on geology, hydrogeology, operations, or other information that may be needed to develop or implement a GSP.

d) Coordinate to conduct stakeholder outreach related to GSP development and adoption.

e) Submit the GSP to DWR by the January 31, 2022 statutory deadline.

f) Ensure all work related to this MOU is performed in accordance with the California Environmental Quality Act and other applicable laws.

g) Coordinate to respond to public comments on the GSP for the Common Basins, as applicable.

h) Address any issues or deficiencies raised by DWR during their review of the GSP within the required time.

i) Explore the role of each Party in implementing the GSP to ensure long-term sustainability and compliance with the Act. The role of each Party will be documented in a future MOU or other agreement. This MOU does not obligate either Party to implement specific groundwater management actions in the Common Basins.

4. Responsibilities of SBCWD

a) SBCWD will act as the contracting entity under this MOU. Subject to approval by SBCWD's authorized representative, SBCWD shall be responsible for executing any Consultant Contract(s) to undertake development of the GSP. SBCWD shall conduct a consultant procurement process that satisfies its own internal consultant procurement policies/criteria.

b) Share relevant data and information with SCVWD as requested.

c) Notify SCVWD of the Consultant(s) selected to develop the GSP.

d) Solicit SCVWD comments on any Consultant Contract(s) related to GSP development prior to execution.

e) Review Consultant invoices for approval and report disputes, if any, to SCVWD within five (5) working days of receipt of invoice. Pay approved invoices and provide copies of invoices to SCVWD with requests for reimbursement as described in Article 6.

f) Solicit SCVWD comments on Consultant deliverables prior to acceptance.

5. Responsibilities of SCVWD

a) Share relevant data and information with SBCWD as requested.

b) Provide comments on proposed Consultant Contract(s) within five (5) working days of receipt.

c) Provide comments on Consultant deliverables within five (5) working days, or other schedule as mutually agreed upon. The SCVWD technical review period for the draft GSP will be a minimum of ten (10) working days.

d) Reimburse SBCWD in accordance with Article 6.

6. Cost Sharing and Payment

The estimated Consultant cost to develop a GSP for the Common Basins is expected to be less than $250,000. Additional Consultant work may be needed to respond to issues raised during DWR review of the GSP. SCVWD agrees to reimburse SBCWD for 10% of the total Consultant cost, with a maximum contribution of $35,000, unless additional funding is authorized in writing through an amendment pursuant to Article 13 of this MOU.

a) SBCWD shall request reimbursement from SCVWD by submitting invoice(s) for incurred Consultant contract costs no more than once a calendar quarter. The invoice(s) shall clearly indicate the SCVWD cost share and shall be accompanied by adequate supporting documentation of related Consultant contract costs, including the hourly rates, hours spent, and information on activities performed in support of the scope of services specified in the Consultant contract(s).

b) Following review and approval of an invoice by SCVWD, SCVWD shall disburse to SBCWD the approved amount within thirty (30) days of receipt of the invoice.

c) An invoice may be rejected by SCVWD only if the invoice contains a material error or paying the invoice would result in SCVWD exceeding its maximum contribution described in this Article. SCVWD shall notify SBCWD of any invoice so rejected, and the reasons therefore.

d) Costs incurred by SBCWD for "in-kind" services including staff time and overhead costs, as well as costs for Consultant oversight, meetings, travel, and incidental expenses shall not be reimbursable by SCVWD.

7. Hold Harmless, Indemnification, Remedies, and Insurance

To the extent permitted by California State law and in proportion to fault, each Party will indemnify, defend, and hold all other Parties and their directors, officers, agents, and employees safe and harmless from any and all claims, suits, judgments, damages, penalties, costs, expenses, liabilities and losses (including without limitation, sums paid in settlement of claims, actual attorneys' fees, paralegal fees, consultant fees, engineering fees, expert fees, and any other professional fees) that arise from or are related in any way to each Party, its employees, officers, or other agents in the operation and/or performance of this MOU; provided, however, that no Party shall indemnify or hold harmless another Party for that Party's own negligent acts, errors, or omissions, or willful misconduct, in the operation and/or performance of this MOU or the performance of the Consultant(s).

Notwithstanding the preceding paragraph, where more than one Party is named in a suit challenging the GSP regarding the Common Basins, or made subject to a claim or penalty regarding the same, the Parties shall coordinate and undertake a joint defense, utilizing a joint defense agreement to the extent possible, subject to the approval of the Parties. Each Party agrees that, to the greatest extent practicable, it shall cooperate in such defense and execute any waivers and/or tolling agreements that may be necessary in order to provide for a single joint defense of such a suit, claim, or imposition of penalty. Any communications between the Parties and any of their respective consultants and attorneys engaged in the joint defense shall be privileged as joint defense communications. Work performed during the joint defense by Consultants or attorneys, to the extent allowed by law, shall be considered attorney work product. Nothing in this paragraph is intended to require a joint defense under circumstances where it would be legally impermissible or under circumstances where it is wholly impractical.

This indemnity provision shall survive the termination of this MOU and the termination of any Party's participation in this MOU. Further, each Party will be liable to the other Party for attorneys' fees, costs, and expenses, and all other costs and expenses whatsoever, which are incurred by the other Party in enforcing this indemnity provision.

In all Consultant contracts funded in whole or part by the Parties, SBCWD shall name the SCVWD and its respective officers, agents, and employees as additional insureds and additional indemnitees in the insurance coverage and indemnity provisions customarily used in the SBCWD professional service contracts.

8. Disputes

Any claim that a Party may have against the other Party regarding the performance of this MOU including, but not limited to, claims for compensation will be submitted to such other Party. The Parties will attempt to negotiate a resolution of such claim and if necessary process an amendment to this MOU or a settlement agreement to implement the terms of any such resolution.

9. Cancellation

If a Party elects to terminate its participation in this MOU, it may do so by delivering to the

other Party a written notice of intention to terminate. Termination shall take effect thirty days following the receipt of notice by the other Party. No portion of the terminating Party's financial contribution provided under this MOU shall be refunded to the terminating Party.

10. Maintenance and Inspection of Books, Records, and Reports

The Parties will, upon reasonable advance written notice, make available for inspection by the other Party all records, books, and other documents directly relating to the GSP or groundwater management for the Common Basins. Prior to release of such documents (other than in response to a request under the California Public Records Act, a subpoena, or court order), all draft information shall be approved by both Parties for finalization and release.

11. MOU Not a Precedent

The Parties intend that the provisions of this MOU will not bind the Parties as to the provisions of any future agreement between them. This MOU was developed specifically for the specified MOU term and purpose.

12. Notices

Any notice, demand, or request made in connection with this MOU must be in writing and will be deemed properly served if delivered in person or sent by Unites States mail, postage prepaid, to the addresses specified herein.

Santa Clara Valley Water District
Attention: Garth Hall, Deputy Operating Officer, Water Supply
5750 Almaden Expressway
San Jose, CA 95118

San Benito County Water District
Attention: Jeff Cattaneo, District Manager
30 Mansfield Road, PO Box 899
Hollister, CA 95024

Any Party may change such contact or address by notice given to the other Party as provided herein.

13. Amendments

The MOU may be amended in the form of written amendment executed by both Parties.

14. Assignment

No Party shall assign, sublet, or transfer this MOU or any of the rights or interests in this MOU without the written consent of the other Party.

15. Severability

The partial or total invalidity of one or more parts of this MOU will not affect the intent or validity or remaining parts of this MOU.

16. Governing Law

This MOU will be deemed a contract under the laws of the State of California and for all purposes shall be interpreted in accordance with such laws.

17. Interpretation

This MOU shall be deemed to have been prepared equally by both Parties, and its individual provisions shall not be construed or interpreted more favorably for one Party on the basis that the other Party prepared it.

18. Contractual Restriction on Consultant's Use of Study Materials

Each Party shall ensure that reasonable contractual restrictions on the consultant's use of the study material and handling of confidential material are included in a written agreement with the consultant.

19. No Third-Party Beneficiaries

This MOU does not and is not intended to confer any rights or remedies upon any person or entity other than the Parties.

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In WITNESS WHEREOF, the parties have executed this MOU as of the effective date.

San Benito County Water District

Approved as to Form

NAME PAULO E. PIRAL
General Counsel

Jeff Cattaneo
General Manager

7/5/17
Date

Santa Clara Valley Water District

Approved as to Form

Erick Soderlund
Assistant District Counsel

Norma Camacho
Interim Chief Executive Officer

6/19/2017
Date

APPENDIX C

GSP Preparation Checklist

Table 1-1. GSP Preparation Checklist

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
Article 3. Technical and Reporting Standards				
352.2		Monitoring Protocols	- Monitoring protocols adopted by the GSA for data collection and management - Monitoring protocols that are designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin	Section 7.2
Article 5. Plan Contents, Subarticle 1. Administrative Information				
354.4		General Information	- List of references and technical studies	Section 10
354.6		Agency Information	- GSA mailing address - Organization and management structure - Contact information of Plan Manager - Legal authority of GSA - Estimate of implementation costs	Section 1.3
354.8(a)	10727.2(a)(4)	Map(s)	- Area covered by GSP (Figure 1-1) - Adjudicated areas, other agencies within the basin, and areas covered by an Alternative (Figure 1-1) - Jurisdictional boundaries of federal or State land (Figure 2-1) - Existing land use designations (Figures 2-7, 2-8) - Density of wells per square mile (Figures 2-3 through 2-6)	Section 2
354.8(b)		Description of the Plan Area	- Summary of jurisdictional areas and other features	Section 2.1
354.8(c) 354.8(d) 354.8(e)	10727.2(g)	Water Resource Monitoring and Management Programs	- Description of water resources monitoring and management programs - Description of how the monitoring networks of those plans will be incorporated into the GSP - Description of how those plans may limit operational flexibility in the basin - Description of conjunctive use programs	Section 2.1.4 Section 2.1.4.1 Section 2.1.4.2 Section 2.1.6
354.8(f)	10727.2(g)	Land Use Elements or Topic Categories of Applicable General Plans	- Summary of general plans and other land use plans - Description of how implementation of the GSP may change water demands or affect achievement of sustainability and how the GSP addresses those effects - Description of how implementation of the GSP may affect the water supply assumptions of relevant land use plans - Summary of the process for permitting new or replacement wells in the basin - Information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management	Section 2.1.5 Section 2.1.5.3 Section 2.1.5.4 Section 2.1.5.5 Section 2.1.6
Article 5. Plan Contents, Subarticle 1. Administrative Information (Continued)				
354.8(g)	10727.4	Additional GSP Contents	**Description of Actions related to:** - Control of saline water intrusion - Wellhead protection - Migration of contaminated groundwater - Well abandonment and well destruction program - Replenishment of groundwater extractions - Conjunctive use and underground storage - Well construction policies - Addressing groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects - Efficient water management practices - Relationships with State and federal regulatory agencies - Review of land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity - Impacts on groundwater dependent ecosystems	Section 2.1.6
354.10		Notice and Communication	- Description of beneficial uses and users - List of public meetings - GSP comments and responses - Decision-making process - Public engagement - Encouraging active involvement - Informing the public on GSP implementation progress	Section 2.1.7 Appendix I Appendix I Section 1.3.1 Appendix D Section 2.1.7 Section 2.1.7

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
Article 5. Plan Contents, Subarticle 2. Basin Setting				
354.14		Hydrogeologic Conceptual Model	- Description of the Hydrogeologic Conceptual Model - Two scaled cross-sections - Map(s) of physical characteristics: topographic information, surficial geology, soil characteristics, surface water bodies, source and point of delivery for imported water supplies	Section 3, Figure 3-7 and 3-10 Figure 3-1,Figure 3-5,Figure 3-4,Figure 3-2, Figure 2-7
9	10727.2(a)(5)	Map of Recharge Areas	- Map delineating existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas	Figure 3-11
	10727.2(d)(4)	Recharge Areas	- Description of how recharge areas identified in the plan substantially contribute to the replenishment of the basin	Section 3.10
354.16	10727.2(a)(1) 10727.2(a)(2)	Current and Historical Groundwater Conditions	- Groundwater elevation data - Estimate of groundwater storage - Seawater intrusion conditions - Groundwater quality issues - Land subsidence conditions - Identification of interconnected surface water systems - Identification of groundwater-dependent ecosystems	Section 4
354.18	10727.2(a)(3)	Water Budget Information	- Description of inflows, outflows, and change in storage - Quantification of overdraft - Estimate of sustainable yield - Quantification of current, historical, and projected water budgets	Section 5.7, Section 5.8, and Section 5.9
	10727.2(d)(5)	Surface Water Supply	- Description of surface water supply used or available for use for groundwater recharge or in-lieu use	Section 2.1.2.1, Section 3.11, Section 5.6.2
354.20		Management Areas	- Reason for creation of each management area - Minimum thresholds and measurable objectives for each management area - Level of monitoring and analysis - Explanation of how management of management areas will not cause undesirable results outside the management area - Description of management areas	Section 5.4
Article 5. Plan Contents, Subarticle 3. Sustainable Management Criteria				
354.24		Sustainability Goal	- Description of the sustainability goal	Section 6.1.1
354.26		Undesirable Results	- Description of undesirable results - Cause of groundwater conditions that would lead to undesirable results - Criteria used to define undesirable results for each sustainability indicator - Potential effects of undesirable results on beneficial uses and users of groundwater	Section 6.2.1 Section 6.3.1 Section 6.4.1 Section 6.6.1 Section 6.7.1
354.28	10727.2(d)(1) 10727.2(d)(2)	Minimum Thresholds	- Description of each minimum threshold and how they were established for each sustainability indicator - Relationship for each sustainability indicator - Description of how selection of the minimum threshold may affect beneficial uses and users of groundwater - Standards related to sustainability indicators - How each minimum threshold will be quantitatively measured	Section 6.2.4 Section 6.3.4 Section 6.4.4 Section 6.6.4 Section 6.7.4
354.30	10727.2(b)(1) 10727.2(b)(2) 10727.2(d)(1) 10727.2(d)(2)	Measureable Objectives	- Description of establishment of the measureable objectives for each sustainability indicator - Description of how a reasonable margin of safety was established for each measureable objective - Description of a reasonable path to achieve and maintain the sustainability goal, including a description of interim milestones	Section 6.2.5 Section 6.3.5 Section 6.4.5 Section 6.6.5 Section 6.7.5

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
Article 5. Plan Contents, Subarticle 4. Monitoring Networks				
354.34	10727.2(d)(1) 10727.2(d)(2) 10727.2(e) 10727.2(f)	Monitoring Networks	- Description of monitoring network - Description of monitoring network objectives - Description of how the monitoring network is designed to: demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features; estimate the change in annual groundwater in storage; monitor seawater intrusion; determine groundwater quality trends; identify the rate and extent of land subsidence; and calculate depletions of surface water caused by groundwater extractions - Description of how the monitoring network provides adequate coverage of Sustainability Indicators - Density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends - Scientific rational (or reason) for site selection - Consistency with data and reporting standards - Corresponding sustainability indicator, minimum threshold, measureable objective, and interim milestone - Location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used - Description of technical standards, data collection methods, and other procedures or protocols to ensure comparable data and methodologies	Section 7.1 Section 7.2
354.36		Representative Monitoring	- Description of representative sites - Demonstration of adequacy of using groundwater elevations as proxy for other sustainability indicators - Adequate evidence demonstrating site reflects general conditions in the area	Section 7.3
354.38		Assessment and Improvement of Monitoring Network	- Review and evaluation of the monitoring network - Identification and description of data gaps - Description of steps to fill data gaps - Description of monitoring frequency and density of sites	Section 7.5 Section 7.5.1 Section 7.5.2 Section 7.1.1
Article 5. Plan Contents, Subarticle 5. Projects and Management Actions				
354.44		Projects and Management Actions	- Description of projects and management actions that will help achieve the basin's sustainability goal - Measureable objective that is expected to benefit from each project and management action - Circumstances for implementation - Public noticing - Permitting and regulatory process - Time-table for initiation and completion, and the accrual of expected benefits - Expected benefits and how they will be evaluated - How the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included. - Legal authority required - Estimated costs and plans to meet those costs - Management of groundwater extractions and recharge	Section 8.0
354.44(b)(2)	10727.2(d)(3)		- Overdraft mitigation projects and management actions	NA
Article 8. Interagency Agreements				
357.4	10727.6	Coordination Agreements - Shall be submitted to the Department together with the GSPs for the basin and, if approved, shall become part of the GSP for each participating Agency.	**Coordination Agreements shall describe the following:** - A point of contact - Responsibilities of each Agency - Procedures for the timely exchange of information between Agencies - Procedures for resolving conflicts between Agencies - How the Agencies have used the same data and methodologies to coordinate GSPs - How the GSPs implemented together satisfy the requirements of SGMA - Process for submitting all Plans, Plan amendments, supporting information, all monitoring data and other pertinent information, along with annual reports and periodic evaluations - A coordinated data management system for the basin - Coordination agreements shall identify adjudicated areas within the basin, and any local agencies that have adopted an Alternative that has been accepted by the Department	N/A

Article 5.			Plan Contents for North San Benito Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
§ 354.			**Introduction to Plan Contents**					
			This Article describes the required contents of Plans submitted to the Department for evaluation, including administrative information, a description of the basin setting, sustainable management criteria, description of the monitoring network, and projects and management actions.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
SubArticle 1.			**Administrative Information**					
§ 354.2.			**Introduction to Administrative Information**					
			This Subarticle describes information in the Plan relating to administrative and other general information about the Agency that has adopted the Plan and the area covered by the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.4.			**General Information**					
			Each Plan shall include the following general information:					
(a)			An executive summary written in plain language that provides an overview of the Plan and description of groundwater conditions in the basin.	17:27	ES			
(b)			A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.	340:348	10			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
§ 354.6.			**Agency Information**					
			When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:					
(a)			The name and mailing address of the Agency.	29:30	1.3			
(b)			The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.	29:30	1.3			
(c)			The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.	29:30	1.3			
(d)			The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.	32	1.4.1			
(e)			An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.	32:33	1.4.2			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.8, 10727.2, and 10733.2, Water Code.					
§ 354.8.			**Description of Plan Area**					

Article 5.			Plan Contents for North San Benito Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Each Plan shall include a description of the geographic areas covered, including the following information:					
(a)			One or more maps of the basin that depict the following, as applicable:					
	(1)		The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.	34, 36:55	2.1	Figure 1-1		
	(2)		Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative.	36, 67	2.1.1	Figure 2-1		
	(3)		Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.	36:40, 68	2.1.2	Figure 2-1		
	(4)		Existing land use designations and the identification of water use sector and water source type.	40, 48:53, 79	2.1.3, 2.1.5	Figure 2-8: Figure 2-13		
	(5)		The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.	37:40, 68:71	2.1.2.1	Figures 2-2: Figure 2-5		
(b)			A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.	36:55, 67	2.1	Figure 2-1		
(c)			Identification of existing water resource monitoring and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.	40:48	2.1.4			
(d)			A description of how existing water resource monitoring or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.	40:48	2.1.4			
(e)			A description of conjunctive use programs in the basin.	40:48	2.1.4			
(f)			A plain language description of the land use elements or topic categories of applicable general plans that includes the following:					
	(1)		A summary of general plans and other land use plans governing the basin.	48:53, 76:79	2.1.5	Figure 2-10: Figure 2-13		
	(2)		A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects	48:53	2.1.5			
	(3)		A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.	48:53	2.1.5			

Article 5.			Plan Contents for North San Benito Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(4)		A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.	53	2.1.5.5			
	(5)		To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.	51:52	2.1.5.3			
(g)			A description of any of the additional Plan elements included in Water Code Section 10727.4 that the Agency determines to be appropriate.	53:54	2.1.6			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10720.3, 10727.2, 10727.4, 10733, and 10733.2, Water Code.					
§ 354.10.			**Notice and Communication**					
			Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:					
(a)			A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.	88:89, 193, 202,	3.10, 6.2.4, 6.3.4, 6.5, 6.6.4, 6.6.7, Appendix D			
(b)			A list of public meetings at which the Plan was discussed or considered by the Agency.	1211:1253	Appendix I			
(c)			Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.	1211:1253	Appendix I			
(d)			A communication section of the Plan that includes the following:					
	(1)		An explanation of the Agency's decision-making process.	357:366	Appendix B			
	(2)		Identification of opportunities for public engagement and a discussion of how public input and response will be used.	393:404	Appendix D			
	(3)		A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.	393:404	Appendix D			
	(4)		The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.	393:404	Appendix D			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.8, 10728.4, and 10733.2, Water Code					
SubArticle 2.			**Basin Setting**					
§ 354.12.			**Introduction to Basin Setting**					

Article 5.			Plan Contents for North San Benito Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.14.			**Hydrogeologic Conceptual Model**					
(a)			Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterizes the physical components and interaction of the surface water and groundwater systems in the basin.	80:100	3	Figures 3-1: Figure 3-11		
(b)			The hydrogeologic conceptual model shall be summarized in a written description that includes the following:					
	(1)		The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.	81:83, 90:94	3.4:3.5	Figures 3-1: Figure 3-5		
	(2)		Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.	82:88, 94	3.5:3.7, 3.9	Figure 3-5		
	(3)		The definable bottom of the basin.	85:86	3.8			
	(4)		Principal aquifers and aquitards, including the following information:					
		(A)	Formation names, if defined.	81:82, 94	3.4	Figure 3-5		
		(B)	Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.	81:88, 94	3.4:3.9	Figure 3-5		
		(C)	Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features.	81:88, 94	3.4:3.9	Figure 3-5		
		(D)	General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.	109:111	4.4 :4.5			
		(E)	Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.	89	3.11			
	(5)		Identification of data gaps and uncertainty within the hydrogeologic conceptual model	89	3.12			
(c)			The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.	85:86, 96:98	3.8	Figure 3-7: Figure 3-9		

Article 5.			Plan Contents for North San Benito Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(d)			Physical characteristics of the basin shall be represented on one or more maps that depict the following:					
	(1)		Topographic information derived from the U.S. Geological Survey or another reliable source.	90		Figure 3-1		
	(2)		Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.	94		Figure 3-5		
	(3)		Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.	93		Figure 3-4		
	(4)		Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.	100		Figure 3-11		
	(5)		Surface water bodies that are significant to the management of the basin.	91		Figure 3-2		
	(6)		The source and point of delivery for imported water supplies.	37:40, 73	2.1.2.1	Figure 2-7		ADD IMPORTED WATER SYSTEM?
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10733, and 10733.2, Water Code.					
§ 354.16.			**Groundwater Conditions**					
			Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:					
(a)			Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:					
	(1)		Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.	132:133		Figure 4-8:Figure 4-9		
	(2)		Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.	127:131		Figure 4-3:Figure 4-7		
(b)			A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.	179		Figure 5-6		
(c)			Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.	118	4.10			
(d)			Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.	109:117, 139:145	4.4: 4.9	Figure 4-15: 4-21		
(e)			The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	106:109, 135:138	4.3	Figure 4-11:4-14		

Article 5.			Plan Contents for North San Benito Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(f)			Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	117:124, 146:148	4.11	Figures 4-22:4-24		
(g)			Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	121, 146:148	4.11.6	Figures 4-22:4-24		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, and 10733.2, Water Code.					
§ 354.18.			**Water Budget**					
(a)			Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.	158:170, 179:186	5.6	Figure 5-6: Figure 5-13	Table 5-2:Table 5-9	
(b)			The water budget shall quantify the following, either through direct measurements or estimates based on data:					
	(1)		Total surface water entering and leaving a basin by water source type.	155:161, 179:180	5.5	Figure 5-6: Figure 5-7	Table 5-2:Table 5-5	
	(2)		Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.	162:169, 181:184	5.6	Figure 5-8:Figure 5-11	Table 5-6:5-9	
	(3)		Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.	162:169, 181:184	5.6	Figure 5-8:Figure 5-11	Table 5-6:5-9	
	(4)		The change in the annual volume of groundwater in storage between seasonal high conditions.	166:169, 171:172, 181:184, 1139:1198	5.8, Appendix G	Figure 5-8:Figure 5-11	Table 5-6:5-9	
	(5)		If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.		NA			
	(6)		The water year type associated with the annual supply, demand, and change in groundwater stored.	169:172, 174, 181:184	5.7:5.8	Figure 5-1, Figure 5-8:Figure 5-11	Table 5-10	
	(7)		An estimate of sustainable yield for the basin.	172:173	5.9		Table 5-11	
(c)			Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:					
	(1)		Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.	162:169, 181:184	5.6	Figure 5-8:Figure 5-11	Table 5-6:5-9	

Article 5.			Plan Contents for North San Benito Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(2)		Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:					
		(A)	A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.	155:161, 179:180, 1139:1198	5.5, Appendix G	Figure 5-6:Figure 5-7	Table 5-2:Table 5-5	
		(B)	A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.	162:169, 181:184, 1139:1198	5.6, Appendix G	Figure 5-8:Figure 5-11	Table 5-6:5-9	
		(C)	A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.	149, 162:169, 181:184, 1139:1198	5.1, 5.6: 5.8 Appendix G	Figure 5-8:Figure 5-11	Table 5-6:5-9	
	(3)		Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:					
		(A)	Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.	154:155, 166:169, 186, 1139:1198	5.4.3, Appendix G	Figure 5-13	Table 5-6:5-9	
		(B)	Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.	154:155, 166:169, 186, 1139:1198	5.4.3, Appendix G	Figure 5-13	Table 5-6:5-9	

Article 5.			Plan Contents for North San Benito Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
		(C)	Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.	154:155, 166:169, 186, 1139:1198	5.4.3, Appendix G	Figure 5-13	Table 5-6:5-9	
(d)			The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:					
	(1)		Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.	149, 174, 177:178, 1139:1198	5.1, Appendix G	Figure 5-1, Figure 5-4:Figure 5-5		
	(2)		Current water budget information for temperature, water year type, evapotranspiration, and land use.	162:169, 181:184, 1139:1198	5.6, Appendix G	Figure 5-8:Figure 5-11	Table 5-6:5-9	
	(3)		Projected water budget information for population, population growth, climate change, and sea level rise.	286, 289, 329, 1139:1198	8.1, Appendix G	Figure 8-1	Table 8-1,8-2	
(e)			Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.	155:169, 181:184, 1139:1198	5.5:5.7, Appendix G	Figure 5-8:Figure 5-11	Table 5-6:5-9	
(f)			The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.	152:155, 1139:1198	5.4, Appendix G			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10727.6, 10729, and 10733.2, Water Code.					
§ 354.20.			**Management Areas**					
(a)			Each Agency may define one or more management areas within a basin if the Agency has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin.	151:152, 175, 405:436	5.3, Appendix E	Figure 5-2		

Article 5.			Plan Contents for North San Benito Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(b)			A basin that includes one or more management areas shall describe the following in the Plan:					
	(1)		The reason for the creation of each management area.	151:152, 405:436	5.3, Appendix E			
	(2)		The minimum thresholds and measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.	188:238	6.1: 6.7			
	(3)		The level of monitoring and analysis appropriate for each management area.	259:274	7			
	(4)		An explanation of how the management area can operate under different minimum thresholds and measurable objectives without causing undesirable results outside the management area, if applicable.	187:238	6			
(c)			If a Plan includes one or more management areas, the Plan shall include descriptions, maps, and other information required by this Subarticle sufficient to describe conditions in those areas.	151:152, 175, 405:436	5.3, Appendix E	Figure 5-2		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
SubArticle 3.			**Sustainable Management Criteria**					
§ 354.22.			**Introduction to Sustainable Management Criteria**					
			This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.24.			**Sustainability Goal**					
			Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.	188	6.1.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10727, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.26.			**Undesirable Results**					

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				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(a)			Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.	191:192, 201, 208:209, 213:214, 223	6.2.1, 6.3.1, 6.4.1, 6.6.1, 6.7.1			
(b)			The description of undesirable results shall include the following:					
	(1)		The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.	192, 201:202, 209,	6.2.2, 6.3.2, 6.4.2, 6.6.2, 6.7.2			
	(2)		The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.	192:193, 202, 209, 215, 231	6.2.3, 6.3.3, 6.4.3, 6.6.3, 6.7.3			
	(3)		Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.	193, 202, 210:212, 215:217, 231	6.2.4, 6.3.4, 6.4.4, 6.6.4, 6.7.4			
(c)			The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.	193:195, 202:204, 212, 217:221, 232	6.2.5, 6.3.5, 6.4.5, 6.6.5, 6.7.5			
(d)			An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.	212	6.5			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.28.			**Minimum Thresholds**					
(a)			Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.	195:200, 204:207, 210:212 221:223, 232:236	6.2.6, 6.3.6, 6.4.4, 6.6.6, 6.7.6			
(b)			The description of minimum thresholds shall include the following:					
	(1)		The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by uncertainty in the understanding of the basin setting.	193:195, 202:204, 212, 217:221, 232	6.2.5, 6.3.5, 6.4.5, 6.6.5, 6.7.5			

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				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(2)		The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.	195:200, 204:207, 210:212 217:221, 232:236	6.2.6, 6.3.6, 6.4.4, 6.6.5, 6.7.6			
	(3)		How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.	195:200, 204:207, 210:212 217:221, 232:236	6.2.6, 6.3.6, 6.4.4, 6.6.5, 6.7.6			
	(4)		How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.	195:200, 204:207, 210:212 217:221, 232:236	6.2.6, 6.3.6, 6.4.4, 6.6.5, 6.7.6			
	(5)		How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.	199, 206:207, 210:212, 217:221, 234:235	6.2.6.5, 6.3.6.5, 6.4.4, 6.6.5, 6.7.6.5			
	(6)		How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.	195:200, 204:207, 210:212 217:221, 232:236	6.2.6, 6.3.6, 6.4.4, 6.6.5, 6.7.6			
(c)			Minimum thresholds for each sustainability indicator shall be defined as follows:					
	(1)		Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:					
		(A)	The rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin.	102:104, 191:200, 127:131, 239	4.1.3, 6.2	Figure 4-3: 4-7, 6-1		
		(B)	Potential effects on other sustainability indicators.	198:199	6.2.6.2			
	(2)		Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.	201:207, 240:241	6.3	Figure 6-2. 6-3		

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				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(3)		Seawater Intrusion. The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Minimum thresholds for seawater intrusion shall be supported by the following:					
		(A)	Maps and cross-sections of the chloride concentration isocontour that defines the minimum threshold and measurable objective for each principal aquifer.	212	6.5			
		(B)	A description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels.	212	6.5			
	(4)		Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.	212:223	6.6			
	(5)		Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:					
		(A)	Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those effects.	207:212	6.4			
		(B)	Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.	135:138, 207:212, 242	6.4	Figure 4-11:4-14, Figure 6-4		
	(6)		Depletions of Interconnected Surface Water. The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results. The minimum threshold established for depletions of interconnected surface water shall be supported by the following:					
		(A)	The location, quantity, and timing of depletions of interconnected surface water.	223:238, 243:258	6.7	Figures 6-5:6-17		
		(B)	A description of the groundwater and surface water model used to quantify surface water depletion. If a numerical groundwater and surface water model is not used to quantify surface water depletion, the Plan shall identify and describe an equally effective method, tool, or analytical model to accomplish the requirements of this Paragraph.	232	6.7.5	Figures 6-5:6-17		

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(d)			An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.	201:207	6.3			
(e)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.	212	6.5			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10733, 10733.2, and 10733.8, Water Code.					
§ 354.30.			**Measurable Objectives**					
(a)			Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.	200, 207, 212, 221:223, 236:237	6.2.7, 6.3.7, 6.4.5, 6.6.6, 6.7.7			
(b)			Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.	200, 207, 212, 221:223, 236:237	6.2.7, 6.3.7, 6.4.5, 6.6.6, 6.7.7			
(c)			Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.	200, 207, 212, 221:223, 236:237	6.2.7, 6.3.7, 6.4.5, 6.6.6, 6.7.7			
(d)			An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.	207	6.3.7			
(e)			Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.	188:190	6.1			
(f)			Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.	200, 207, 212, 221:223, 236:237	6.2.7, 6.3.7, 6.4.5, 6.6.6, 6.7.7			
(g)			An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.	200, 207, 212, 221:223, 236:237	6.2.7, 6.3.7, 6.4.5, 6.6.6, 6.7.7			
			Note: Authority cited: Section 10733.2, Water Code.					

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				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					
SubArticle 4.			**Monitoring Networks**					
§ 354.32.			**Introduction to Monitoring Networks**					
			This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.34.			**Monitoring Network**					
(a)			Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.	259:269	7.1		Table 7-1	
(b)			Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:					
	(1)		Demonstrate progress toward achieving measurable objectives described in the Plan.	259:269	7.1		Table 7-1	
	(2)		Monitor impacts to the beneficial uses or users of groundwater.	259:269	7.1		Table 7-1	
	(3)		Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.	259:269	7.1		Table 7-1	
	(4)		Quantify annual changes in water budget components.	259:269	7.1		Table 7-1	
(c)			Each monitoring network shall be designed to accomplish the following for each sustainability indicator:					
	(1)		Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:					
		(A)	A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.	260:262, 275	7.1.1	Figure 7-1	Table 7-1	
		(B)	Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.	260:262, 275	7.1.1	Figure 7-1	Table 7-1	
	(2)		Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.	263:264	7.1.2			

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	(3)		Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.	265	7.1.4			
	(4)		Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.	260, 265:267, 278	7.1.5	Figure 7-4	Table 7-1	
	(5)		Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.	260, 264, 277	7.1.3	Figure 7-3	Table 7-1	
	(6)		Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:					
		(A)	Flow conditions including surface water discharge, surface water head, and baseflow contribution.	260, 267:269, 276	7.1.6	Figure 7-2	Table 7-1	
		(B)	Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.	260, 267:269, 276	7.1.6	Figure 7-2	Table 7-1	
		(C)	Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.	260, 267:269, 276	7.1.6	Figure 7-2	Table 7-1	
		(D)	Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.	260, 267:269, 276, 279	7.1.6	Figure 7-2, Figure 7-5	Table 7-1	
(d)			The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.	259:269, 275:279	7.1	Figure 7-1:75	Table 7-1	
(e)			A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.	259:269, 275:279	7.1	Figure 7-1:75	Table 7-1	
(f)			The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:					
	(1)		Amount of current and projected groundwater use.	259:269	7.1		Table 7-1	
	(2)		Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.	259:269	7.1		Table 7-1	

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	(3)		Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.	259:269	7.1		Table 7-1	
	(4)		Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.	259:269	7.1		Table 7-1	
(g)			Each Plan shall describe the following information about the monitoring network:					
	(1)		Scientific rationale for the monitoring site selection process.	259:269	7.1			
	(2)		Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.	269:271	7.2			
	(3)		For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.	259:269	7.1			
(h)			The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.	259:269	7.1			
(i)			The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.	269:271	7.2			
(j)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.	259:269	7.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, 10728, 10733, 10733.2, and 10733.8, Water Code					
§ 354.36.			**Representative Monitoring**					
			Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:					
(a)			Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.	271	7.3			
(b)			(b) Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:					

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	(1)		Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.	271	7.3			
	(2)		Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.	271	7.3			
(c)			The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.	271	7.3			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2 and 10733.2, Water Code					
§ 354.38.			**Assessment and Improvement of Monitoring Network**					
(a)			Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.	272:274	7.5		Table 7-2	
(b)			Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.	272:274	7.5		Table 7-2	
(c)			If the monitoring network contains data gaps, the Plan shall include a description of the following:					
	(1)		The location and reason for data gaps in the monitoring network.	273			Table 7-2	
	(2)		Local issues and circumstances that limit or prevent monitoring.	272:274	7.5		Table 7-2	
(d)			Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.	272:274	7.5		Table 7-2	
(e)			Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:					
	(1)		Minimum threshold exceedances.	259:269	7.1			
	(2)		Highly variable spatial or temporal conditions.	259:269	7.1			
	(3)		Adverse impacts to beneficial uses and users of groundwater.	259:269	7.1			
	(4)		The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.	259:269	7.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10728.2, 10733, 10733.2, and 10733.8, Water Code					
§ 354.40.			**Reporting Monitoring Data to the Department**					

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				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10728, 10728.2, 10733.2, and 10733.8, Water Code.					
SubArticle 5.			**Projects and Management Actions**					
§ 354.42.			**Introduction to Projects and Management Actions**					
			This Subarticle describes the criteria for projects and management actions to be included in a Plan to meet the sustainability goal for the basin in a manner that can be maintained over the planning and implementation horizon.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.44.			**Projects and Management Actions**					
(a)			Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.	287:289	8.2		Table 8-2	
(b)			Each Plan shall include a description of the projects and management actions that include the following:					
	(1)		A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent. The Plan shall include the following:					
		(A)	A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management actions, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.	291:328	8.3.3:8.12.3			
		(B)	The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.	291:328	8.3.4:8.12.4			
	(2)		If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.		NA			
	(3)		A summary of the permitting and regulatory process required for each project and management action.	291:328	8.3.5:8.12.5		Tables 8-2	

Article 5.			Plan Contents for North San Benito Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(4)		The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.	293:328	8.3.8:8.12.7			
	(5)		An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.	291:328	8.3.7:8.12.7			
	(6)		An explanation of how the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.	290:327	8.3.1:8.12.1			
	(7)		A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.	280:318	8.1:8.8			
	(8)		A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.	293:328	8.3.9:8.12.7			
	(9)		A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.	289:318, 323:326	8.3:8.8, 8.11			
(c)			Projects and management actions shall be supported by best available information and best available science.	289:328	8.3:8.12			
(d)			An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.	290:328	8.3.2:8.12.3			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					

APPENDIX D

Communication Plan

Community Engagement Plan

For Development and Adoption of a Groundwater Sustainability Plan (GSP) for San Benito County Water District Groundwater Sustainability Agency (GSA)

- **Commenced October 2018**
- **Adoption of GSP: SBCWD, November 2021, SCVWD, December 2021**

Purpose, Outcomes, and Goals

The purpose of the Community Engagement Plan (CEP) was to support the San Benito County Water District (District) GSA and Santa Clara Valley Water District (the GSA for portions of the basin in Santa Clara County) in (1) engaging the general community, stakeholders, and other interested parties by providing them with balanced and objective information to assist in understanding the Sustainable Groundwater Management Act (SGMA), available options, and recommendations, (2) creating an open process for public input on the development of the Groundwater Sustainability Plan (GSP), (3) performing required public noticing, and (4) documenting in the GSP the opportunities for public engagement and active involvement of diverse social, cultural, and economic elements of the population within the basin area.

These communication and outreach efforts support the overarching purpose of SGMA, which is to ensure local sustainable groundwater management in medium- and high-priority groundwater basins statewide.

Outcomes: The desired outcome for this CEP was to achieve adoption of the GSP with input from and in consideration of the basin's diverse people, economy, and ecosystems.

Plan Goals: SGMA requires GSAs to consider the interests of all beneficial uses and users of groundwater and encourage involvement of diverse social, cultural, and economic elements of the population within the basin area during GSP preparation.

The goals of the Community Engagement Plan were to:

- Enhance understanding and inform the public about water and groundwater resources in the basin,
- Inform the public and stakeholders of the purpose, benefits, and need for sustainable groundwater management and a sustainable groundwater management plan (GSP).
- Engage a diverse group of interested parties and stakeholders and promote informed feedback from stakeholders, the general community, and groundwater-dependent users throughout the GSP preparation.
- Reach out to and engage disadvantaged communities throughout the GSP preparation process.
- Employ a comprehensive public engagement process utilizing a variety of outreach methods that make public participation easy and accessible; hold meetings at times and venues that encourage broad participation.
- Respond to public concerns and provide accurate and up-to-date information.
- Manage the community engagement program in a manner that provides maximum value to the public and an efficient use of GSA and local agency resources.

Time Period: The CEP is a fluid, working document - updates and revisions to this plan were made through 2021 before being finalized as part of the draft and final GSP. This CEP is intended to cover communication and outreach efforts from June 2018 through December 2021.

Audiences: Among the interested parties which the GSA must consider and engage with when developing the GSP are:

- Agricultural users of water
- Domestic well owners
- Municipal well operators
- Public water system operators
- General population of urban water users
- Land use planning agencies
- Environmental users of groundwater
- Surface water users
- The federal government
- California Native American tribes
- California Department of Water Resources
- Disadvantaged communities

See Appendix A for a list of the interested parties/stakeholders identified within the basin area.

Approach

To truly engage the public in development of a GSP that is science-based, complex, technical, and includes achievable outcomes, the GSA will:

- Educate the public in compelling ways. Communicate what may often be complex concepts in simple and compelling ways with graphics and examples.
- Manage expectations. Avoid "anything goes" meetings that might pursue unrealistic and unpractical approaches.
- Show how the input received has been incorporated into the plan or process. Demonstrating to the public how their ideas have been reflected in the plan or planning process is an important piece to the puzzle.
- Remain focused on results. Understand objectives of each public meeting and facilitate the achievement of those objectives.
- Respond to stakeholder inquires in a timely manner.

Communications Tools and Forums

Collateral (Informational) Materials

Developing a variety of collateral materials is critical to successful education and necessary to circulate consistent, accurate information. A range of materials were developed, including:

- Overview Fact Sheet: SGMA and its requirements, the District's role as GSA (and Santa Clara Valley Water District, the GSA for portions of the basin in Santa Clara County), general groundwater and basin information (bilingual)
- Water Management Fact Sheet: water supply sources, partnerships, groundwater management tools (bilingual)
- GSP Requirements Fact Sheet: review of SGMA/GSA/GSP, goals and requirements of the GSP (bilingual)
- GSP Progress Report 2020: Summary of the progress of the Groundwater Sustainability Plan and the draft chapters 1-9.
- Groundwater Management Fees Fact Sheet: explanation of the methodology and rationale behind the fees to support the GSP
- Draft Plan Complete Fact Sheet: Summary of the Plan, Plan Area, Groundwater Conditions and Potential Projects and Management actions

Public Workshops
Public educational workshops provide opportunities for people to learn about groundwater, SGMA, financing options, and GSP elements. Workshops were organized in a variety of ways, including open houses, "stations" where people can ask questions one-on- one, world café style, and traditional presentations, which facilitated question and answer sessions. In order to solicit feedback from people who may not be comfortable speaking in public, workshops included small group breakout discussions.

Six workshops were held, between fall, 2018 and winter, 2021: Kickoff, Groundwater Conditions, Sustainability Criteria, Management Options, Management Actions, and Draft GSP. A public hearing on GSP Adoption was in November 2021.

Due to the pandemic, starting in early spring 2020, all workshops were held via Zoom. This platform allowed the GSA to be engaged with the public in workshops. The SBCWD/GSA website was also a valuable tool to disseminate information to the public. Items such as presentations to the Technical Advisory Committee (TAC) were published on the website, along with draft chapters, an easy to navigate comments page and other informative information to help the public understand our local basin, the GSP process and what management actions and projects were being considered. Mailchimp, a platform that helps you manage customers and other interested parties, was also utilized to inform those that signed-up of any developments with the plan.

Other Public Meetings/Hearings
These were formal opportunities for people to provide official comments for the record, on programs, plans, and proposals. SGMA requires that a public meeting be held prior to the adoption of a fee and that public hearings are held for the adoption of GSP elements and the final GSP. There are also constitutional requirements for public hearings for some fee/rate options. The GSA held required public meetings/hearings, but also used less formal public workshops (described above) to solicit feedback and information early in the process. Monthly updates on GSP progress and milestones were also given at the SBCWD's monthly board meetings.

Media

- News Releases: at milestones and for public workshops, for distribution to local and regional media, as well as to email subscribers to the releases. List of news releases and articles:

  January 2015, BenitoLink (online news media), Free Lance Newspaper and website, "New Legislation adds to the Need to Manage Local Water Resources" – Shawn Novack, Water Conservation Program Manager
  September 2015 – BenitoLink, article on "Water Forum" a live workshop where SGMA was discussed. John Chadwell, reporter
  May 2017 – BenitoLink, "County water district will control basin as state takeover looms", John Chadwell
  April 2017 – BenitoLink, article on Water Forum, a live workshop where SGMA was discussed, "Experts, politicians speak at Water Forum", BenitoLink Staff
  October 2018 – BenitoLink, Free Lance newspaper and website. "Community Invited to first workshop on Groundwater Sustainability Plan", Shawn Novack, Water Conservation Program Manager
  June 2019, BenitoLink, Free Lance newspaper and website, "Understanding the Sustainable Groundwater Management Act", Shawn Novack, Water Conservation Program Manager
  August 2019, BenitoLink, "Groundwater Plan is Moving Along", Shawn Novack Water Conservation Program Manager
  March 2020, BenitoLink, "Water Resources Association of San Benito County updates community on Groundwater Sustainability Plan", Shawn Novack, Water Conservation Program Manager

July 2021, BenitoLink, "Water agency releases Groundwater Sustainability Plan for public review", BenitoLink Staff

- Advertising: ads for public workshops were published in local newspapers or online news sites

Website
The District's new website (www.sbcwd.com – unveiled in summer, 2018) has a set of pages dedicated to the Sustainable Groundwater Management project (Project). These pages were used as a tool for distributing and archiving communications materials as well as a repository for studies and reports. The website was updated as frequently as new information became available, usually monthly. The Project home page is also provided in Spanish, and all other pages can be translated via the Google translate tool on each page.

The dedicated web pages include the following SGMA/GSA/GSP information:

- Project home page
  - Introduction/summary
  - Latest update
  - Email signup tool
- About SGMA
  - The Sustainable Groundwater Management Act
  - SGMA Groundwater Management Tools
- SBCWD's Role & Responsibilities
  - Groundwater Sustainability Agency
- About Groundwater & Our Basins
  - What is Groundwater?
  - SBCWD's Groundwater Basins
  - Basin Conditions
  - The Role of Surface Water
- Community Involvement
  - Importance of Community Involvement
  - Role of the TAC
  - Upcoming public meetings/workshops
  - Email signup tool
- Resources & Documents
  - External links
  - SBCWD GSA and related documents
- FAQs

Social Media
Postings to third-party platforms such as the "What's Going on in Hollister" Facebook page and the Next Door neighborhood social media site, served as an additional channel of information/updates to community members.

Disadvantaged Community Engagement
Disadvantaged Communities (DACs) are specifically referenced in SGMA as an interested party. A large percent of the people living in the DAC areas are relatively recent immigrants from Spanish-speaking countries.

Connecting with communities through existing organizations such as League of United Latin American Citizen (LULAC) and through community events and schools provided an opportunity to share information and solicit feedback on rate/fee options and GSP elements. Bilingual materials in Spanish are available.

Governance Agencies Briefings
GSA Board members were encouraged to periodically brief local officials (city councils, the county, members of other elected and appointed bodies) with updates on GSA activities. A meeting of local elected officials took place in December 2020 for a briefing on the Groundwater Sustainability Plan.

During the period of GSP development, the GSA presented to the public each chapter of the GSP, which included topics of Sustainability Criteria, Management Actions/Monitoring, Implementation Plan and Fee Structure/Development.

- **Audiences**
    - An existing list of stakeholders was utilized, with a focus on landowners who may be affected by Sustainability Criteria and Management Actions. Plus, the GSA's website has a sign-up area for interested parties to receive updates on the Plans development.
- **Key Messages**
    - Defined Sustainability Criteria and Management Actions
    - Explained why these are needed as part of the GSP, how they fit into the big picture
    - Provided information on what they might mean to stakeholders/landowners
    - Provided examples (primarily of Management Actions), making clear that they are in development and input is requested
    - Offered information on upcoming opportunities to comment/participate in development of Sustainability Criteria and Management Actions elements
- **Tools**
    - Developed fact sheet "Progress Report 2020" – provide brief overview; status of GSP development; next steps; updated schedule (English and Spanish versions)
    - Informational boards focusing on Sustainability Criteria, and Management Actions
    - Updated website to reflect current status and upcoming steps (updated monthly)
    - Distributed news releases announcing community meetings on these issues
    - Drafted talking points outlining concepts of Sustainability Criteria and Management Actions, for use by GSA board and staff
    - Drafted direct mail piece sent to key stakeholders/potentially affected landowners with overview information on the concepts of Sustainability Criteria and Management Actions; provided additional direct mail inviting them to relevant community meetings
    - Drafted articles for the media and WRASBC newsletters
    - Developed print and web ads as needed for community meetings or milestones
    - Conducted one-on-one discussions with those expressing overt concerns
    - Encouraged community leaders who are willing to publicly express their support for the GSP to do so

Appendix A*: Consideration of Interests
**This list is not exhaustive or exclusive*

Cities, Towns, Counties
- City of Hollister
- City of San Juan Bautista
- San Benito County
- Santa Clara County
- San Benito County Planning Commission
- Hollister Planning Commission
- San Juan Bautista Planning Commission

Native American Tribes

Federal Government Agencies
- National Oceanic & Atmospheric Administration/National Marine Fisheries Service
- US Army Corps of Engineers
- Natural Resource Conservation Service
- US Fish and Wildlife Service
- US Environmental Protection Agency

State Government Agencies
- California Coastal Conservancy
- California Department of Water Resources (DWR)
- California Department of Fish and Wildlife
- California Parks and Recreation, Hollister Hills SVRA

Regional Government Agencies
- Association of Monterey Bay Area Governments (AMBAG)
- Central Coast Regional Water Quality Control Board (RWQCB) – Region 3
- Central Coast Resource Conservation & Development Council
- Pajaro River Watershed Flood Prevention Authority (PRWFPA)
- San Benito Resource Conservation District

Non-Government Organizations
- San Benito County Farm Bureau
- Central Coast Groundwater Coalition
- Water Resources Association of San Benito County
- San Benito Agricultural Land Trust
- Wildlands Inc.

Planning and Conservation League
Sierra Club, Loma Prieta Chapter
The Nature Conservancy

Public Water Systems
Sunnyslope County Water District
San Benito County Water District
Santa Clara Valley Water District
Aromas Water District
Tres Pinos County Water District

Agriculture
San Benito County Farm Bureau

Organizations that Represent Environmental Uses of Groundwater
Central Coast Groundwater Coalition
Sierra Club
Nature Conservancy

Organizations Representing Disadvantaged Communities
League of United Latin American Citizens (LULAC)

Private Well Owners

Business Organizations
City of Hollister Chamber of Commerce
City of San Juan Bautista Chamber of Commerce
San Benito County Chamber of Commerce

Education
San Benito High School District
Aromas/San Juan Unified School District
San Benito County Office of Education
Hollister School District

Businesses / Developers
Arnold/Bannon's Mobile Home Park
Casa De Fruta Orchards and Water System
Whispering Pines Inn

Service /Political Organizations

- League of Women Voters
- Democratic and Republican Clubs
- Rotaries
- Kiwanis
- SIRS
- Community Foundation for San Benito County

Technical Advisory Committee meetings:

Although not required by SGMA, the District valued the contributions of a Technical Advisory Committee (TAC), to assist in reviewing and contributing to the technical aspects of the GSP as its elements were produced. The TAC was made up of individuals selected to represent GSP-related subject areas, including but not limited to environmental, technical, and land use planning fields. This diverse group of experts in their respective fields were responsible for reviewing the GSP scope of work, draft products, and materials prepared by consultants, analyzing them, and providing recommendations to the GSP Technical Team to develop a technically-sound GSP. The TAC members and their affiliated organizations are presented below:

Name	Organization
Benny Young	County of San Benito
Garrett Haertel	San Benito County Water District
Jeff Micko	Micko Consultants
Abraham Prado	City of Hollister
Roger Pierno	Valley Water
Stan Pura	Mission Ranches
Don Ridenhour	San Benito County resident / PE
Paul Rovella	Johnson, Rovella, Retterer, Rosenthal & Gilles, LLP
Bob Swanson	Bob Swanson Ranch LLC
Greg Swett	San Benito County Farm Bureau
Drew Lander	General Manager Sunnyslope County Water District

Process for the TAC Committee:

- Present materials

- TAC reviews materials
- TAC comments
- Revise as needed

Sixteen TAC meetings were held:

1. August 2018 – Explanation of SGMA and expectations of TAC responsibilities
2. November 2018 – Overview of GSP & Plan Area. What is sustainability
3. January 2019 – Continued discussion on defining sustainability
4. April 2019 - Introduction to the Hydrogeologic Conceptual Model and groundwater conditions
5. August 2019- Management areas, updated sustainability criteria, schedule
6. October 2019 – Draft section on Water Budget presented, sustainability goal definition, GSP schedule
7. January 2020 – Revised Water Budget, Numerical Model, Sustainability Criteria for water quality
8. February 2020 – Continued discussion Sustainability Criteria for water quality
9. April 2020 – TAC meeting held by Zoom. Setting Sustainability Criteria Groundwater Levels
10. July 2020 – TAC meeting held via Zoom. Setting Sustainability Criteria for Chronic Decline of Groundwater Storage
11. August 2020 – TAC meeting held via Zoom. Continued discussion Chronic Decline of Groundwater Storage. Next steps for Sustainability Criteria
12. September 2020 - TAC meeting held via Zoom. Monitoring network and reporting. Measuring agricultural pumping. Summary of data gaps and next steps.
13. November 2020 - TAC meeting held via Zoom. Measuring groundwater use. Discussed meters, satellite data and ground sensors.
14. December 2020 - TAC meeting held via Zoom. Continued discussion on measuring groundwater use. Discussed funding GSP development and implementation.
15. February 2021 - TAC meeting held via Zoom. Discussion on monitoring and managed aquifer recharge. Projects and Management Actions
16. April 2021 - TAC meeting held via Zoom. Simulate future scenarios including climate change, growth and land use changes. Projects and Management Actions and implementation.

Six Public Workshops were held:

1. November 2018 – Introduction to SGMA and Groundwater Sustainability Agency role.
2. June 2019 – SGMA and the GSP process. Plan Area, Hydrogeologic Conceptual Model, Overview of North San Benito Basin, Aquifer materials, Groundwater conditions, Groundwater quality.
3. September 2020 – Workshop held via Zoom. Topics: SGMA and the GSP process. Update on what's been accomplished and what needs to be accomplished. Discussion on groundwater levels, groundwater quality, GDEs, storage, water budget, what is sustainability, minimum thresholds, one basin with four management areas.
4. December 2020 – Water budget and sustainable yield.
5. March 2021 – Implementation: monitoring, reporting, projects and management actions. Funding GSP implementation.
6. August 2021 – Overview of SGMA and GSP process, North San Benito County Basin defined, Sustainable Management, Projects and

Management Actions. It was at this meeting the Draft GSP was presented to public.

July 2021 - Public Meeting on Groundwater Management Fee

Mailers:
1,340 direct mail pieces were sent to landowners outside of the Hollister Urban Area with 5+ acre parcels

Articles:
Water Resources Association San Benito County newsletter (bill insert):
Keeping our Local Groundwater Basin Sustainable 2018

San Benito County Farm Bureau:
Newsletter to members with information about SGMA/GSP 2021

SBCWD Website (Sustainability Pages):
Updates done monthly
Website, email sign-up:
Chapters of the GSP were posted to the District website encouraging comments from the community
Progress Reports
Meeting dates

Booth at San Benito County Fair October 1st-3rd, 2021

Staffed booth at San Benito County Fair Pavilion. A Fact Sheet entitled: Draft Plan Completed was available to the public and a representative was on hand for questions. Information on how to view/comment on GSP was also available.

GSP Adoption Dates (public hearings):

SBCWD November 17, 2021
SCVWD (Valley Water) December 14, 2021

*Send to DWR for review after adoption

APPENDIX E

Technical Memoranda

Data to Support GSP Preparation, December 19, 2018

Summary of Management Area Definition for North San Benito Basin, August 14, 2019

Data Management System, May 2021

December 19, 2018

TECHNICAL MEMORANDUM

To: Jeff Cattaneo, GSP Project Manager
San Benito County Water District GSA

From: Maureen Reilly, PE, Chad Taylor, PG, CHG, and Iris Priestaf, PhD

Re: Data to Support GSP Preparation

1. EXECUTIVE SUMMARY

San Benito County Water District (SBCWD) and Santa Clara Valley Water District (SCVWD) are the Groundwater Sustainable Agencies (GSAs) for their respective service areas overlying the Bolsa, Hollister, San Juan Bautista, and Tres Pinos Valley groundwater basins, termed collectively as the North San Benito Groundwater Basin (Basin). In accordance with the Sustainable Groundwater Management Act (SGMA), SBCWD and SCVWD are preparing a Groundwater Sustainability Plan (GSP) for the Basin. The purpose of this Technical Memorandum (TM) is to assess the availability of data to support the GSP.

SBCWD and SCVWD have a long history of groundwater management and data collection. These agencies regularly collect, assess, and report on groundwater conditions and these data serve as the bulk of what is needed to support the GSP. In addition, the California Department of Water Resource (DWR) has been developing state and regional data sets to help local agencies fill data gaps; some examples are the subsidence data available on the SGMA Map Viewer and the state-wide landuse for 2014.

Nonetheless, there are still data gaps, generally defined in DWR's GSP Regulations as a lack of information that significantly affects the understanding of the basin setting or the evaluation of GSP implementation effectiveness and potentially limits the ability to know if a basin is being sustainably managed. As documented in this TM, gaps have been identified in available data on surface water and streamflow, availability of groundwater monitoring wells in some areas of the basin, hydrogeological data including aquifer parameters and basin depth, specific knowledge of well locations and well construction, and data on groundwater pumping. The GSP preparation process will likely reveal some additional data gaps; however, this early assessment of data allows timely development of plans to fill data gaps with more monitoring, additional analyses, or improved data collection.

2. INTRODUCTION

Preparation of a GSP requires compilation, organization, checking, and subsequent analysis of relevant data and information relating to the hydrology, climate, topography, soils, land use conditions, hydrogeology, groundwater, and water use in a basin. SBCWD and SCVWD have actively monitored and managed water resources in their respective service areas for decades, and the availability of information reflects long-standing cooperative efforts among these and other agencies at the local, regional, state, and federal levels. SBCWD, which encompasses most (>90 percent) of the basin, has conducted active monitoring and has prepared Annual Groundwater Reports for over 30 years; these annual reports compile and analyze a range of data addressing climate, groundwater levels/storage, water quality, surface water flow, water imports, wastewater discharges and water recycling, water balances, and water use in the context of basin management. The data compilation and management for the GSP builds on this existing monitoring and data management and incorporates relevant data from SCVWD to provide complete coverage for the Basin.

To comply with SGMA and GSP Regulations, the existing monitoring and data management efforts are being expanded and refined to collect types of data relevant to SGMA sustainability criteria[1]. Many of the datasets summarized in this TM have been compiled from readily-accessed public sources or previously completed reports, while others have been requested from state and local agencies. Consistent with Best Management Practices provided by the Department of Water Resources (DWR), these data have been reviewed for quality and consistency and compiled into standardized formats to facilitate further use and analysis in preparation of the GSP; these formats include an Access database, an ESRI Geographic Information System (GIS) geodatabase, Excel workbooks, and written reports. Data also are considered in terms of study period, selecting a study period that best represents basin conditions and recognizes SGMA requirements.

This TM addresses the following:

- Study periods
- Data types and sources
- Technical and reporting standards
- A data management system (DMS)
- Initial identification of data gaps.

3. STUDY PERIODS

SGMA documentation and analysis involves definition of various study periods (and time steps) for historical, current, and projected future conditions. In brief, historical conditions must include at least 10 years. Availability of data for update, extension, and refinement of the numerical model is considered key. The study period for the numerical model begins in water year 1975 and will be extended to 2017, using available data. This period includes

[1] Groundwater level decline, storage depletion, water quality degradation, subsidence, and adverse impacts on connected surface water and groundwater-dependent ecosystems (GDEs). Seawater intrusion is not applicable.

droughts and wet periods, with an average annual rainfall of 12.97 inches, which is comparable to the long-term average of 12.9 inches (1875-2017). To comply with SGMA, consideration of the future will involve projection of rainfall and streamflow data into the future for 50 years (e.g., use data from 1967-2017).

4. DATA TYPES AND SOURCES

This section summarizes data types and sources with the intent of evaluating overall availability of information; references are provided as part of the GSP document.

4.1 Hydrology

4.1.1 Climate Data (precipitation, evaporation, temperature)

Climate data collection stations and records have been reviewed and assessed for the previously mentioned Annual Reports. A key data source is the California Irrigation Management Information System (CIMIS), which is a program unit within DWR that manages a network of more than 145 automated weather stations in California. This network is designed to assist irrigators in managing their water resources more efficiently. The two stations in the Basin are:

- Station #126 located in Hollister with available data from 6/9/1994
- Station #143 located in San Juan with available data from 1/1/1998

Precipitation data from CIMIS station #126 have been affected by periodic irrigation overspray that has been recorded on the sensors. The District is considering means to resolve this problem.

Long term precipitation data are available from various Hollister gage stations from 1875 to 1996; these data were published in the 1996 Annual Groundwater Report. Together the historical station and CIMIS records provide 143 years of rainfall data. Additional data are available from the National Oceanic and Atmospheric Administration (NOAA) and other sources.

Information on the geographic distribution of precipitation has been collected from the PRISM Climate Group, which gathers climate observations from a wide range of monitoring networks, applies sophisticated quality control measures, and develops spatial climate datasets. These datasets incorporate a variety of modeling techniques and are available at multiple resolutions covering the period from 1895 to the present. These datasets include elevation-varying average precipitation isohyets that can be used to estimate or simulate precipitation throughout the watershed contributing to Basin. Additional isohyetal maps are available (for example, from SCVWD). For geographic distribution of evapotranspiration, DWR zone mapping is available.

4.1.2 Surface Water Body Location Mapping

Mapping data for surface water features have been provided from publicly available sources. These mapped data include locations of aqueducts, rivers, streams, drainages,

lakes, and ponds. These data are presented in the project geodatabase in feature classes named *HydrologyArcs,* and *HydrologyPolygons*.

In addition to surface water body mapping, local subwatershed area mapping also is available. These mapped subwatersheds provide a standard nested watershed delineation scheme using the State Water Resources Control Board (SWRCB) numbering scheme. The hierarchy of watershed designations consists of six levels of increasing specificity: Hydrologic Region (HR), Hydrologic Unit (HU), Hydrologic Area (HA), Hydrologic Sub-Area (HSA), Super Planning Watershed (SPWS), and Planning Watershed (PWS). The dataset in the project geodatabase includes all the subwatersheds within the Pajaro River watershed.

4.1.3 Surface Water and Streamflow Data

Four streamflow gage stations are maintained in or near the Basin by the United States Geological Survey (USGS) with funding by SBCWD. These stations are located on San Benito River Near Willow Creek School (USGS 11156500), San Benito River at Hwy 156 Near Hollister Ca (USGS 11158600), Tres Pinos Creek Near Tres Pinos Ca (USGS 11157500) and Pacheco Creek Near Dunneville, CA (USGS 11153000). These stations are all active and have records that begin in February 1938, December 1970, February 1938, and 1940, respectively. In addition, USGS maintains a gage on the Pajaro River at Chittenden, which is downstream of the confluence of the Pajaro and San Benito rivers; this gage has records extending back to 1939.

In previous years, the District monitored select locations on a quarterly basis and this information is included in the project database. In recent years this monitoring has been interrupted partly because most tributary waterways have been dry during the drought.

4.1.4 Mapping of Natural Communities Commonly Associated with Groundwater

One of the components of the GSP Regulations is identification of Groundwater Dependent Ecosystems (GDEs), which are defined in the GSP Regulations as ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. A statewide database and mapping tools, developed by DWR, provides geographic information on Natural Communities Commonly Associated with Groundwater. While these do not necessarily represent GDEs, the dataset is a starting point in identifying GDEs. The mapping data for watersheds surrounding the Basin are included in the project geodatabase in the *Hydrology* feature dataset in feature classes named *GDE_NCCAGWetlands* and *GDE_NCCAGVegetation*.

4.2 Topography, Soils, Land Uses

4.2.1 Ground Surface Elevation Data

Ground surface elevation data are available from the USGS in the form of National Elevation Dataset (NED) GIS grid files (rasters) and raster and vector topographic map datasets. Both datasets have been compiled for the area surrounding the Basin. The 10-meter resolution NED data have been combined into a single raster.

4.2.2 Aerial Photographs

Aerial photographs of the area surrounding the basin have been downloaded from the USGS National Aerial Imagery Program (NAIP) for 2004, 2005, 2006, 2009, 2010, 2012, 2014, and 2016. These aerial photographs are all rectified GIS raster datasets and included in the project geodatabase.

4.2.3 Soil Maps

Soil information for the areas surrounding the Basin have been downloaded from the Natural Resources Conservation Service (NRCS, 2018). Soil data are mapped and maintained by NRCS in a standardized format that is compatible with tools that NRCS makes freely available to the public. The soils data for the area surrounding the basin have been maintained in the standard NRCS formats to facilitate flexible future use. These raw data are available for use in the preparation of a number of soil data presentations and analyses. The hydrologic soil group data from these datasets have been also mapped using the NRCS *Soil Data Development Toolbox.* These data are in the *Soils* feature dataset in the project geodatabase.

4.2.4 Soil Index

The Soil Agricultural Groundwater Banking Index (SAGBI) is a suitability index for groundwater recharge on agricultural land, for example water spreading in dormant orchards or on fallow land. The SAGBI is based on five major factors for managed aquifer recharge on agricultural lands: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition. The coverage is available through an online web tool by the California Soil Resource Lab at UC Davis and UC-ANR and DWR https://gis.water.ca.gov/app/cadwrlanduseviewer/.

4.2.5 Land Use Maps

Land use map data have been collected from DWR, the California Department of Conservation Farmland Mapping and Monitoring Program (FMMP), and counties of San Benito and Santa Clara. The available land use maps are indicated below:

- DWR: 2014 statewide land use mapping specifically developed for SGMA and GSPs.
- San Benito County: 1997 and 2002
- Santa Clara County: 2014
- San Benito County Water District Update: 2010
- FMMP: 1984, 1986, 1988, 1990, 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012, 2014, and 2016
- County Crop Reports
- Land Use and General Plans: County, Hollister, San Juan Bautista

4.2.5.1 DWR Land Use Maps

DWR has an ongoing program to conduct annual land-use surveys. The emphasis is mapping agricultural land and crop types, but also includes information on general urban land uses and native vegetation (i.e., undeveloped land). DWR surveys include more than 70 different crops or crop categories. Some surveys, but not all, have mapped irrigation methods and

water sources. For San Benito County, maps are available in GIS format for years 1997 and 2002. Todd Groundwater and SBCWD updated the DWR 2002 land use map using a 2010 aerial photo in the northern county area to assess changes in irrigation demand. Results have been documented in a technical memorandum and included in SBCWD's Annual Groundwater Report.

DWR has been developing a state-wide land use map and online mapping tool. The coverage has been downloaded and stored in the GSP geodatabase.

4.2.5.2 Farmland Mapping and Monitoring Program

Farmland mapping data are available as GIS polygon files and included in the geodatabase. The FMMP datasets present farmland by broad category related to its overall quality, as described below.

FMMP's study area is contiguous with modern soil surveys developed by the US Department of Agriculture (USDA). A classification system that combines technical soil ratings and current land use is the basis for the Important Farmland Maps of these lands. Most public land areas, such as National Forests and Bureau of Land Management holdings, are not mapped. The categories include:

- Prime Farmland (P)
- Farmland of Statewide Importance (S)
- Unique Farmland (U)
- Farmland of Local Importance (L)
- Grazing Land (G)
- Urban and Built-up Land (D)
- Other Land (X)
- Water (W)

4.2.5.3 County Crop Reports

The San Benito County Agricultural Commissioner publishes annual reports on the total crop acreage by crop in the county. Crop Reports are available on the Commissioner's website from 1941 through 2016. While the crop reports do not show the location of acreages, county-wide changes in crop type and total area are informative in years when DWR land use maps are not available. Crop reports are also available for Santa Clara but the reports only present totals for the whole county and not for the small area in the groundwater basin.

4.2.5.4 General Plans

San Benito County, Santa Clara County, the City of Hollister, and the City of San Juan Bautista publish general plans that show current and future land use for their planning areas. The coverages associated with these plans are stored in the GSP geodatabase.

4.3 Hydrogeology

4.3.1 Geologic Mapping of Surficial Geology and Faults

Surficial geology in the area of the Basin has been mapped by the California Geological Survey (CGS) in the 2002 *Geologic Map of Monterey 30' x 60' Quadrangle and Adjacent Areas*. This mapped geology has been digitized into GIS formats available from the CGS, and these complete datasets are included in the GSP geodatabase. In addition to this digital geologic map, there are also published geologic maps are available in other formats. These include the 1972 *Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County* prepared by Kilburn (USGS) and numerous geologic maps for individual topographic quadrangles prepared by Brabb, Clark, Dibblee, and others and published by the USGS.

4.3.2 Well Records, Lithology, and Well Construction

The well completion reports for all the sections within the Basin were requested and received from DWR on behalf of SBCWD. Appropriate confidentiality of well completion reports is being maintained per agreements among SBCWD, SCVWD, and DWR. SBCWD has been the permitting agency in San Benito County since 2004 and maintains well records in addition to those available from DWR. SBCWD well record files include more information than the DWR records including borehole and well locations, construction, and use. SBCWD well files have been scanned to support the GSP.

Well completion reports from DWR and those from SBCWD files are being used to aid construction of cross sections and to assist in definition of lateral basin boundaries and bottom. The first step has been identification of the geographic location of each borehole or well. Few of the well record files from DWR or SBCWD include reliable geographic coordinates (e.g. latitude and longitude); accordingly, borehole and well locations must be estimated based on other information in the well record files. Some DWR records and all SBCWD records include San Benito County Assessor's Parcel Numbers (APNs) that can be used to identify the property on which the well or borehole is located. Those DWR records that include neither location coordinates nor APN can only be located based on maps provided by drillers or well owners; these maps are often inadequate. The well records from both sources have been reviewed and organized according to ease of location identification. Boreholes and wells that can be readily located from geographic coordinates or APN have been plotted and are included in GIS datasets; this includes all wells from SBCWD well records that correspond to current APNs. The remaining well records are being further reviewed and those that are close to planned cross section lines will be plotted and added to the GIS datasets. Following the completion of the borehole and well location task, the well records for the located wells will be digitized to capture general well information (i.e. identification, owner, type, size, etc.) and well construction and lithology data for use in the creation of cross sections.

4.3.3 Subsidence

The online DWR SGMA mapping tool provides several datasets to quantify subsidence that has occurred and the potential for subsidence:
https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

4.3.3.1 NASA JPL InSAR Dataset

Vertical ground surface displacement rates are derived from Interferometric Synthetic Aperture Radar (InSAR) data collected by the European Space Agency (ESA) Sentinel-1A satellite and processed by the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL), under contract with DWR. Changes in vertical displacement can be viewed through the DWR SGMA mapping tool. This monitoring program began in 2015 and does not document subsidence that occurred prior to that date.

4.3.3.2 UNAVCO Continuous GPS Sites

Also available through the DWR SGMA mapping tool is the Continuous GPS (CGPS) stations and associated data. These stations continuously measure the three-dimensional (3D) position of a point on or near the earth's surface. For subsidence studies, vertical movement (subsidence and uplift) is most relevant; data on horizontal movement can help discern tectonic movement that is an important local factor. There are seven stations within and around the Basin with data from as early as 2004.

4.4 Groundwater Monitoring

4.4.1 Groundwater Elevation Data

As with well locations, groundwater elevation records have been collected from multiple sources, including previous investigations, SBCWD, SCVWD, USGS NWIS, DWR CASGEM, and others. Data from these sources have been collected, reviewed, and compiled into a single unified groundwater elevation dataset. SBCWD has been monitoring groundwater since 1977 and drilled a multiport nested well in 2005 which is regularly monitored. The current SBCWD network totaled 91 wells in October 2017. SCVWD provides quarterly data for 10 wells in the Llagas area, located on the north side of the Pajaro River.

In addition, water levels from DWR's Water Data library and the USGS National Water Information System have been included in the project database to ensure all historical measurements are included. Including all three sources, the Groundwater Elevation database contains 272 unique wells with data ranging from 1924 to 2018.

For wells with only depth to water measurements and no reference elevation data, groundwater elevations have not been calculated. In addition, wells with water level data, water quality data, pumping data, and well logs have not been cross referenced. Often the same well may have multiple local names in addition to a state well number. The GSP process includes assignment to each well of a unique identifier and removal of duplicate information.

Groundwater elevation data are presented in the *Groundwater Levels* project database, which has been structured according to the requirements of the DWR CASGEM program.

4.4.2 Groundwater Quality Database

SBCWD currently monitors a distributed network of 18 wells for water quality. Data from these monitoring wells and other water quality data are included in SBCWD's water quality database. SBCWD maintains this comprehensive water quality database, created in 2004

with a State Local Groundwater Assistance Grant and updated every three years. The most recent update in 2016 included available data from SBCWD, Regional Water Quality Control Board (including regulated facilities, wastewater plants, and spills), California State Water Resources Control Board (including municipal and small water systems, Tres Pinos Water District, City of Hollister, and Sunnyslope County Water District (SSCWD). In addition, data published as part of previous investigations have been added to the database. The database now contains over 450,000 records from 175 water systems or regulated facilities and over 1,800 monitoring locations.

4.5 Water Use

4.5.1 Production Wells/Pumping Data

Groundwater is pumped by private well owners for irrigation, industrial, and domestic uses and by public water supply retailers for municipal and small community purposes.

4.5.1.1 Municipal water supply wells

The major municipal suppliers are the City of Hollister, Sunnyslope County Water District, and City of San Juan Bautista. All three agencies report their monthly pumping to SBCWD for publication in the Annual Groundwater Report. The City of Hollister has four active wells, Sunnyslope has five active wells, and San Juan Bautista has two active wells. Monthly pumping data are available for all three agencies from 1995 to 2018.

4.5.1.2 Agricultural and rural domestic water use

Estimates of agricultural pumping amounts are available for the Zone 6 portion of the Basin. SBCWD monitors the hours of operation of large wells in Zone 6 and converts hours of operation to production volume based on infrequent measuremens of pump discharge rate. This approach is incapable of accounting for changes in pump discharge pressure (for sprinkler versus furrow irrigation, for example) or seasonal and interannual changes in static depth to water. Hours of pump operation are recorded on a semi-annual basis. This information is included in the database. Pumping in areas outside of Zone 6 is not metered. For groundwater modeling purposes, estimates of agricultural pumping at a field scale have been computed using crop type, crop coefficient, evapotranspiration, and irrigation efficiency. Rural domestic use in Zone 6 is evaluated through an annual survey sent by SBCWD to registered well owners (excepting the relatively large well monitored by SBCWD); most of these pumpers probably would be considered too small (de minimis) and exempt from SGMA requirements for monitoring groundwater use.

4.5.1.3 Small water system wells

There are about 100 small water systems in the Basin. The general location and number of wells are available from the State Water Resources Control Board Division of Drinking Water. A table of these systems, estimated population, and number of supply wells is in the database; this information is used for estimating water consumption. The California Environmental Health Tracking Program http://cehtp.org/water/map-viewer revealed the approximate location of 50 systems in San Benito County and one system in Santa Clara County.

4.5.2 Imported Water

SBCWD and SCVWD manage the imported water from the Central Valley Project (CVP) for their respective service areas. Imported water data volumes, uses, and locations of delivery are documented by SBCWD for Zone 6 and included in the project database. The volumes of imported water delivered to municipal sources, agricultural uses, managed recharge, and evaporative losses are recorded monthly from 1988 to 2018. Major imported water delivery pipelines are included in the GIS datasets in the project geodatabase.

SCVWD delivers some imported water to portions of the Basin in Santa Clara County. SCVWD provided semiannual delivery volumes for the two customers in the GSP area from 1995 to 2017.

4.5.3 Recycled Water and Wastewater

The City of Hollister produces recycled water for irrigation purposes, including landscape irrigation in the City's Riverside (Brigantino) Park . SBCWD provides delivery of recycled water to nearby agricultural customers. Delivered amounts and distribution locations are included in the project database.

The City of Hollister and Sunnyslope discharge some wastewater in unlined ponds. The approximate amount of groundwater recharge from these ponds is calculated on a water year basis and included in the project database.

4.6 Planning Documents and other Studies

4.6.1 Jurisdictional Areas of State, Federal, and Local Agencies

State, local, and federal boundaries within and surrounding the Basin have been compiled from state and federal sources. These boundaries include all water districts and other local agencies near the basin as well as federally owned land. These boundaries are included in the *JurisdictionalAreas* feature dataset in the project geodatabase.

4.6.2 Water Resources Planning Documents and Technical Studies

Numerous planning documents and technical studies are available for reference in preparing the GSP; recent key documents are listed below. State planning documents will also be included, including the Water Quality Control Plan (Basin Plan).

- Annual Groundwater Reports
- Groundwater Management Plan (1998 and 2003)
- Development of a Water Quality Monitoring Program (2004)
- Salt Nutrient Management Plan (2014)
- Pajaro River Watershed Integrated Regional Water Management Plan (2007)
- Hollister Urban Area Water and Wastewater Master Plan Report (2008)
- Urban Water Management Plan (2016)
- San Benito County General Plan Update (2016)

5. TECHNICAL AND REPORTING STANDARDS

Compilation of data and information to support the GSP has adhered to standards for data, reporting, monitoring, and GIS, as applicable (**Reg. § 352**). Data are documented with source of the data, types and methods of measurements, and comments on protocols, when available. Well information will include available data, per requirements of **Reg. § 352.4 (c)**.

6. DATA MANAGEMENT SYSTEM (DMS)

SBCWD has been collecting and compiling groundwater data annually including water levels, water quality, and water use for the Annual Groundwater Report. These data and data from SCVWD and other sources are being compiled in a relational database, which consists of an Access database, GIS geodatabase, and Excel workbooks and has capabilities for queries to quickly check and summarize data. As part of the GSP, the data management system has been redesigned to be practicable, usable, intuitive, and cost effective. The DMS will have the capability to distinguish data according to subbasins and management areas.

A second TM detailing the final DMS and its uses will be prepared after the GSP analysis has been completed.

7. DATA GAP IDENTIFICATION AND EVALUATION

The available data described above have been reviewed considering SGMA requirements and sustainability criteria to identify gaps in geographic and temporal coverage. The DWR GSP Regulations define a data gap as *a lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation and could limit the ability to assess whether a basin is being sustainably managed.* The following data gaps have been identified; recommendations are provided for their resolution with the recognition that 1) definition of significant data gaps may change as GSP preparation proceeds and 2) the means of resolving data gaps may change, including the timing.

7.1.1 Climate Data (precipitation, evaporation, temperature)

Previous Annual Reports have relied on precipitation data from the Hollister CIMIS station; however, overspray from nearby irrigation sprinklers has variously affected the rain gage. This problem has been recognized by the District which is considering means of restoring accurate data collection. Compilation and evaluation of other rainfall data sources (e.g., NOAA) could support replacement and/or correction of the CIMIS data.

7.1.2 Surface Water and Streamflow Data

There currently are four active surface water monitoring stations, which are operated by USGS. In addition, SBCWD historically has measured flows at intervals on selected locations; these measurements were intended mostly to yield information on surface water-groundwater interactions and to thereby support water balance analyses and modeling. The GSP update and extension of the water balance and model is the appropriate time to review and revamp the SBCWD surface water monitoring efforts. Information on rates of percolation along surface water channels (involving synoptic surveys) has been identified as

a data gap. In addition, identification of groundwater-dependent ecosystems (GDEs) may require additional surface water monitoring and groundwater elevation monitoring that is linked to monitoring of groundwater levels in water supply wells. Information is needed on groundwater discharges within and near the basin, including springs, seeps, and wetlands.

7.1.3 Stormwater Flow

A portion of the stormwater in the City of Hollister is captured and recharged in the wastewater treatment ponds. This stormwater represents a source of supply that may be amenable to additional management actions as part of the GSP, pending documentation of past recharged volumes, monitoring of these flows, and consideration of future capture and recharge plans from the City of other local agencies.

7.1.4 Groundwater Monitoring Wells

SBCWD has been addressing gaps in its monitoring program for groundwater elevation and quality. As summarized in the attached memorandum, SBCWD has developed a plan to identify new monitoring locations; the attached map showing monitored and unmonitored areas also has been developed. SBCWD recognizes that preparation of the GSP is an opportunity to expand the groundwater monitoring programs to the southern portion of the Basin, to identify areas where data are needed to support water balance analyses and modeling for management areas (as may be defined), and to provide monitoring for sustainability criteria such as surface water-groundwater interactions and GDEs.

7.1.5 Hydrogeologic Conceptual Model

The southern portions of the Basin warrant particular attention because information on hydrogeology and groundwater conditions is relatively sparse. Available data will be analyzed for description of the hydrogeologic conceptual model, documentation of groundwater conditions, and quantification of water budgets, and specific data gaps will be defined. Suitable existing wells will be identified for use as potential monitoring points; exploratory drilling and development of new monitoring facilities is likely warranted.

7.1.6 Well Completion Reports and Data Management

Well completion reports have been compiled from DWR and SBCWD and have been categorized with regard to reliability of location information and potential usefulness in developing the hydrogeologic conceptual model (including cross sections). Identification of well locations is likely to be ongoing; nonetheless, focused areas for well location efforts may be defined as part of GSP preparation.

In addition, the wells with water level data, water quality data, pumping data, and well logs have not been cross referenced. Often the same well may have multiple local names in addition to a state well number. As part of the GSP process, each located well is being assigned with a unique identifier and duplicate information is being removed.

7.1.7 Groundwater Pumping and Use

SGMA requires annual reporting of groundwater use for all users in a basin except the de minimis extractors (pumping two acre-feet/year or less). Groundwater pumping is measured

in SBCWD Zone 6 but not elsewhere. Accordingly, the monitoring program will be reviewed in terms of extension to cover the entire basin.

Information on irrigation schedules and efficiencies has been identified as needed to calculate return flows from agricultural water use.

Attachments:

SBCWD Technical Memorandum, Sustainable Groundwater Management Act-Process for Establishing Well Network to Monitor Groundwater in San Benito County, November 21, 2018.

Todd Groundwater, Monitored and Unmonitored Areas, North San Benito County, map prepared for SBCWD, December 2018.

TECHNICAL MEMORANDUM

Subject: Sustainable Groundwater Management Act –

Process for Establishing Well Network to Monitor Groundwater in San Benito County

Prepared For: Jeff Cattaneo, P.E. SBCWD General Manager

Prepared by: David Macdonald, Assistant Engineer

Reviewed by: Garrett Haertel, P.E. Deputy District Engineer

Date: November 21, 2018

Organization of TM

- Background
- Purpose
- Discussion
- Conclusions
- Recommendations

BACKGROUND

San Benito County Water District (SBCWD) has continuously managed the groundwater in San Benito County for over 50 years. In 2017, SBCWD became the Groundwater Sustainability Agency (GSA) for San Benito County to satisfy requirements of the Sustainable Groundwater Management Act (SGMA). This designation allows SBCWD to be the lead agency in preparing a Groundwater Sustainability Plan (GSP) for a significant portion of San Benito County.

After reviewing the current network of monitored wells, it became evident that in order to fully comply with SGMA, additional wells were needed to increase monitoring coverage of the groundwater basin.

PURPOSE

The purpose of this technical memorandum is to detail the procedure for finding and adding new wells to the monitoring network.

DISCUSSION

Additional wells are needed in the San Juan Bautista, Tres Pinos Valley, Bolsa, and Hollister sub-basins in order to provide quality coverage. Todd Groundwater is SBCWD's consultant regarding groundwater management, and they have provided a map titled "Historically Monitored Wells" which indicates areas where data is lacking. These areas were targeted in the search for additional

wells to add to the monitoring network. SBCWD utilized the following procedure to locate potential wells to add extra coverage within the groundwater subbasins.

Finding Wells for Monitoring Groundwater Conditions

First Method

1. Determine areas of need based on the "Historically Monitored Wells" map.
2. Use county GIS map to determine Assessor's Parcel Number (APN) of parcels within areas of need.
3. Use the APNs to locate well logs within SBCWD's files.
4. Locate the well on an aerial map to verify location/existence.

Second Method

1. Search the targeted areas on an aerial map to locate wells that may not be in SBCWD's files. This is done by looking for pipes and lone power poles in locations where a well would be advantageous.
2. Use the coordinates from Google Maps to map the location of the well on ArcGIS.
3. Use county GIS map to determine APN numbers of parcels within areas of need.
4. Confirm and verify location.

Acquiring Rights to Use Wells for Monitoring Groundwater Conditions

1. Use APN's to determine the owner of each well.
2. Produce and send a letter requesting permission to access the well for water level measurements and/or test water quality.
3. Once permission is granted, visit site and determine method of measurement/testing.

Repairing/Re-activating Previous Wells for use

1. Determine wells with access issues and follow up with owner to get keys/access.
2. Determine wells that can be altered/repaired to re-activate, and assess access.
3. If well can be reactivated, assess well condition (functioning, collapsed, etc.)

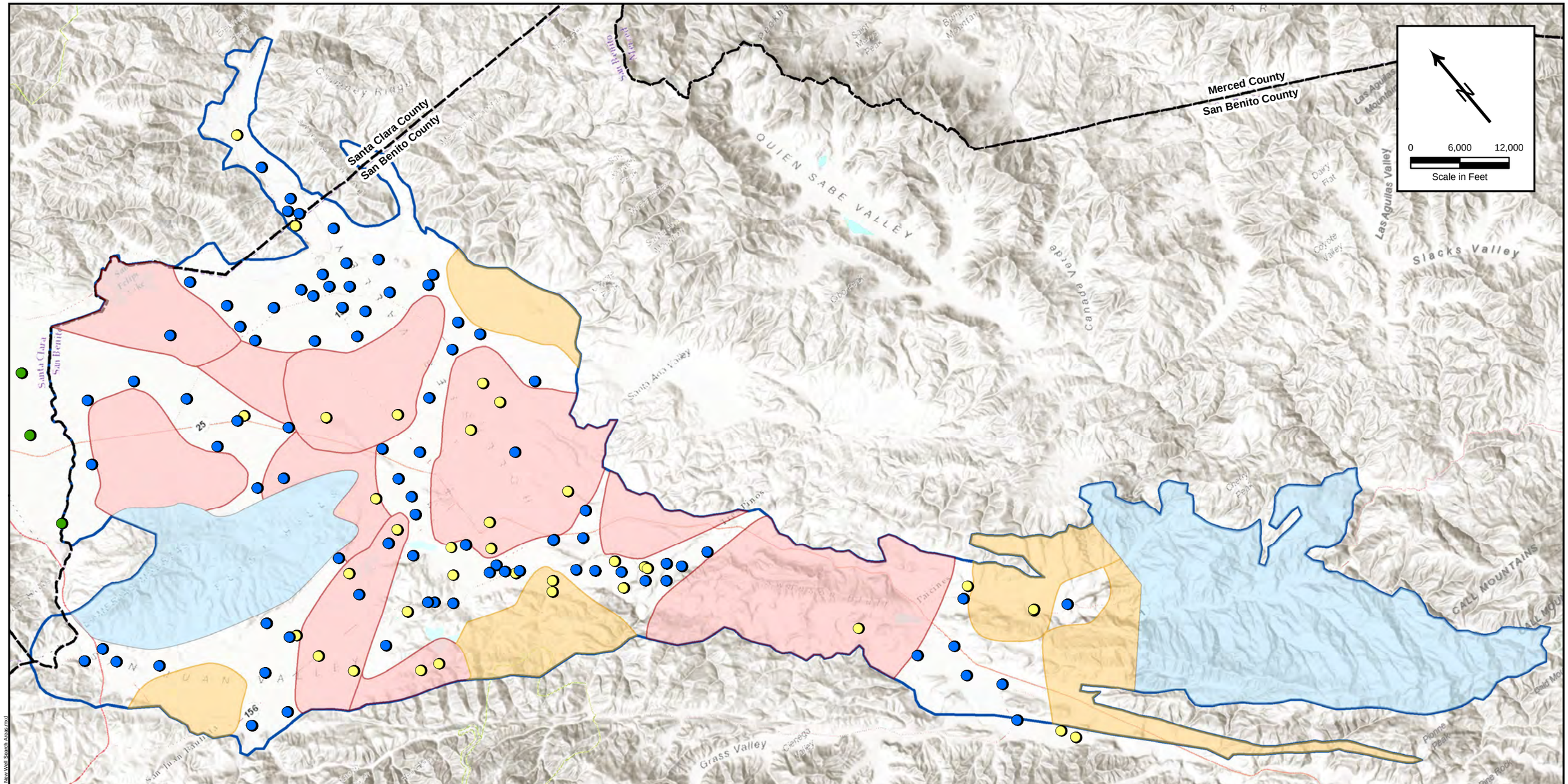
CONCLUSIONS

More monitoring wells are necessary to cover the entire area of the groundwater basins in San Benito County. This effort will improve the quality and credibility of data that SBCWD can produce to ensure compliance with SGMA. SBCWD's groundwater management activities can be further improved by increasing the amount of data collected within the county subbasins.

RECOMMENDATIONS

Based on this information it is recommended that the following actions be taken:

- Locate as many potential wells as possible.
- Request Owners to allow SBCWD access/permission to monitor groundwater conditions.
- Increase long term monitoring network.



- SBCWD Monitored Wells, October 2018
- SCVWD Monitored Wells, October 2018
- Well Monitored in Prior Years and not October 2018
- Adequately Monitored Areas
- High Priority Target Area
- Low Priority Area
- Areas with Few to No Wells
- North San Benito Basin

December 2018

TODD GROUNDWATER

Monitored and Unmonitored Areas North San Benito Basin

August 14, 2019

TECHNICAL MEMORANDUM DRAFT

To: Jeff Cattaneo, GSP Project Manager
San Benito County Water District GSA

From: Iris Priestaf, PhD

Re: Summary of Management Area Definition for North San Benito Basin GSP

1. INTRODUCTION

This memorandum summarizes Management Areas as subdivisions of the North San Benito Basin and in terms of their role in the GSP. As defined in the GSP Regulations, the purpose of Management Areas (MAs) is to *facilitate implementation of the GSP*. The major objective for this Summary Technical Memorandum is to present the rationale for creating each MA.

Management Areas will be described in the GSP, specifically in the upcoming Section 6, Sustainable Management Criteria, which is scheduled for presentation to the TAC in May 2020. This Section 6 will describe the sustainability goal, present MAs, characterize undesirable results, and establish minimum thresholds and measurable objectives for each sustainability indicator. These indicators will be described for each MA. Consistent with the GSP Regulations, MAs will be presented in terms of:

- Reason for creation of each management area
- If a GSP includes one or more management areas, the GSP shall include descriptions, maps, and other information required by the GSP Regulations sufficient to describe conditions in those areas
- Level of monitoring and analysis appropriate for each MA
- Explanation of how management of MAs will not cause undesirable results outside the MA

The North San Benito Basin shown in **Figure 1** encompasses about 205 square miles in northern San Benito County including small portions in southern Santa Clara County. The Basin is in the Pajaro River watershed; most of the area is drained by the San Benito River and its tributaries, while northeastern portions are drained by tributaries to the Pajaro River. The Basin is characterized by a series of valleys bounded and separated by uplands. Relatively large valleys include Paicines Valley, San Juan Valley, Hollister Valley, and the Bolsa, which is a broad, flat area bounded by the Pajaro River on the north. The major valleys are the locales of intensive groundwater use, irrigated agriculture, the cities of Hollister and San Juan Bautista, and rural communities, while the uplands are mostly

rangeland. **Figure 1** illustrates the elongated shape and varied topography of the North San Benito Basin, which are factors in defining Management Areas. Stated simply, the Basin is too long and varied to be managed easily as a single unit, so more than one MA is warranted for GSP implementation.

A major factor in defining Management Areas is availability of water supply sources. While recognizing that water supply availability (in terms of sources, infrastructure, and institutional arrangements) can change in the future, current availability is a reasonable starting point. SBCWD provides local surface water from Hernandez and Paicines reservoirs that is provided to a local zone of benefit, Zone 3, and imported Central Valley Project (CVP) water that is provided to Zone 6. Zones 3 and 6 are shown on **Figure 2,** including areas of overlap. CVP water also is provided by Santa Clara Valley Water District (SCVWD) to some customers in Santa Clara County.

Since the 1950s, SBCWD has managed local groundwater using various definitions of local groundwater basins and subbasins. DWR previously defined four subbasins and basins (including Tres Pinos Valley Basin and three subbasins of the Gilroy-Hollister: Bolsa, Hollister, and San Juan Bautista); these have been combined into the North San Benito Basin. SBCWD also defined subbasins in 1996 to support its groundwater management in northern portions of the basin. These were based on hydrogeologic and other factors, including Zone 6 boundaries. The Zone 6 subbasins included Pacheco, Bolsa Southeast, San Juan, Tres Pinos, and Hollister (with additional subdivisions). A Bolsa subbasin (outside Zone 6) was defined.

As defined in the GSP Regulations, a Management Area is an area within a basin for which the GSP may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors. While an MA may have different minimum thresholds and may be operated to different measurable objectives than the basin at large, undesirable results must be defined consistently throughout the basin and the operation of the MA must be managed in a way that does not cause undesirable results outside the MA. The purpose of dividing a basin into management areas is to facilitate implementation of the GSP.

This memorandum presents four Management Areas for the North San Benito Basin as shown in **Figures 1 and 2**:

- Southern
- Hollister
- San Juan
- Bolsa

The definition of each MA is described in the following sections in terms of the basis for creation of the MA. The MAs will be used in the water budget analysis (to be presented in Section 5 of the GSP) and in numerical modeling. MAs will be used to help define the sustainability criteria (undesirable results, minimum thresholds, management objectives), which will be described in Section 6.

2. DEFINITION OF SOUTHERN MANAGEMENT AREA

As shown in the maps, the Southern MA is characterized by uplands and small valleys along the San Benito River and Tres Pinos Creek. Land uses are predominantly rural residential, rangeland, and agricultural (mostly truck crops and vineyards), which rely on groundwater supply provided mostly by private wells.

A key factor differentiating the Southern MA from the other MAs is access to Zone 3 surface water and the absence of any effects of Central Valley Project (CVP) water delivered to Zone 6. Pumping in the MA is also distant from the adjoining Hollister MA. Most of the pumping is in Paicines and Tres Pinos Creek Valleys, which are separated from the Hollister MA by three miles of more rugged terrain where there is little pumping. Groundwater in Southern MA is recharged in part by releases from Hernandez and Paicines reservoirs, and portions of Southern MA are within Zone 3. No imported water is provided to Southern MA, which does not overlap with Zone 6.

3. DEFINITION OF HOLLISTER MANAGEMENT AREA

As shown in **Figures 1** and **2,** the Hollister MA includes the Hollister Valley and adjacent uplands mostly to the south. The Hollister MA differs from the adjoining MAs because of its variety of land uses, multiple jurisdictions, and multiple sources of water supply. Its boundary with the Bolsa and Southern MAs follows the boundary of Zone 6. The boundary with the San Juan MA—which includes part of Zone 6—crosses the narrow point in the valley floor at the upstream end of the San Juan Valley and traces the topographic divides on either side of the gap. The Hollister Valley includes intensive agriculture, rangeland, rural residential, urban, and industrial land uses. The MA includes all or portions of the City of Hollister, Sunnyslope County Water District, Pacheco Pass Water District, Tres Pinos County Water District, Hollister Hills SVRA, and areas in Santa Clara County.

Sources of water supply include local groundwater (recharged in part by releases from Hernandez and Paicines reservoirs), CVP imported water, and recycled water. Most of the MA is within Zone 6 and it includes lands that are in both Zone 3 and Zone 6. A small amount of CVP water also is provided by SCVWD to a few customers in Santa Clara County parts of the MA. Production wells include irrigation, domestic, and public water supply wells throughout the MA, with greater well density in the northern half of the MA.

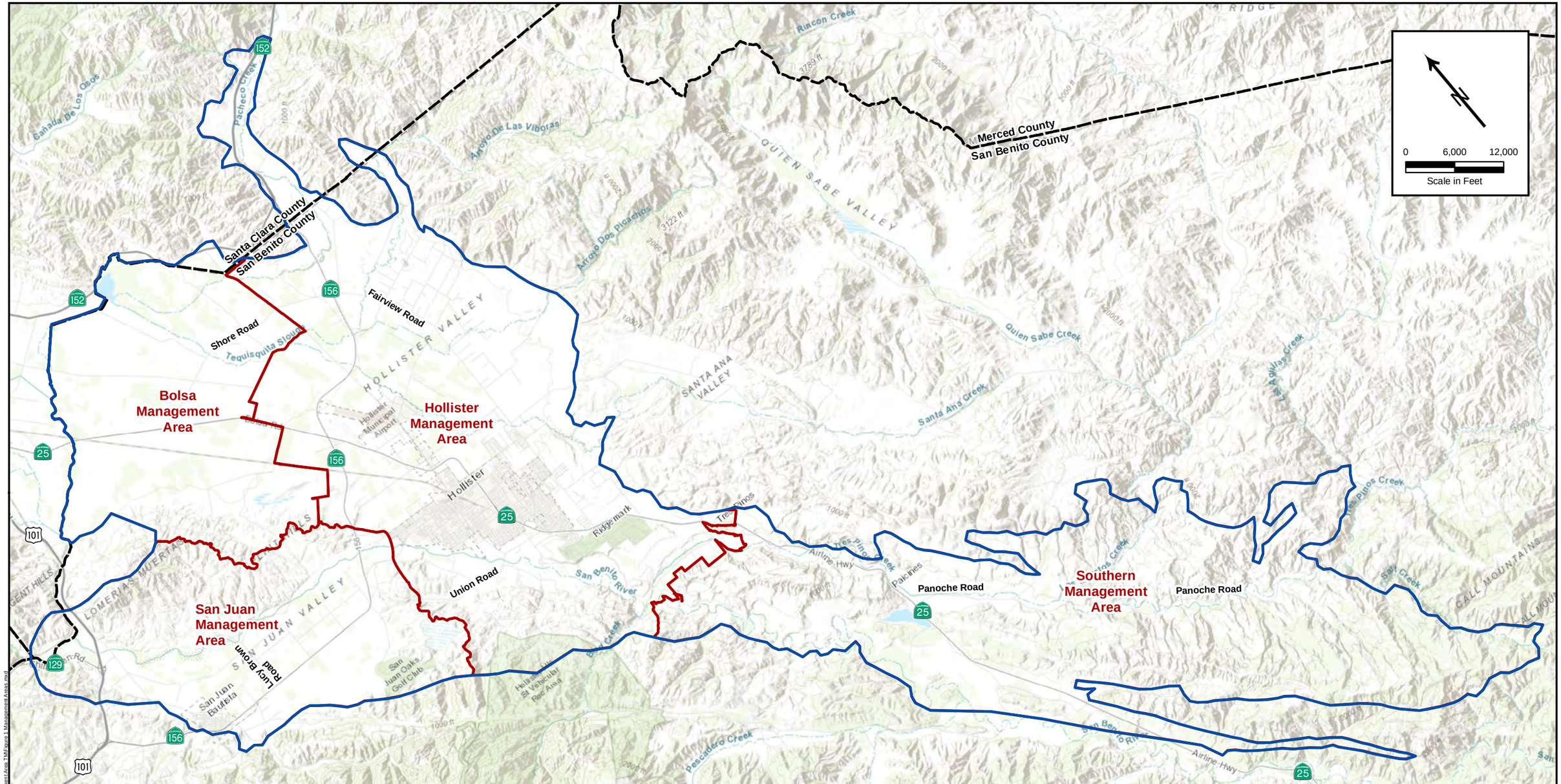
4. DEFINITION OF SAN JUAN MANAGEMENT AREA

The San Juan MA includes the San Juan Valley and adjacent uplands. Important characteristics of the San Juan MA are the various land uses, multiple jurisdictions, and multiple sources of water supply. The San Juan Valley is characterized by prime farmland and intensive agriculture, while the uplands are mostly rangeland with some rural residential and industrial land uses. The MA includes most of the City of San Juan Bautista and small areas of the City of Hollister, Aromas Water District, and Santa Clara County.

Sources of water supply include local groundwater (recharged in part by releases from Hernandez and Paicines reservoirs) and CVP imported water. The valley portions of the MA are mostly within Zone 3 and Zone 6 with some areas in Zone 6 only (see **Figure 2**). The MA differs from the Hollister MA primarily because of a much higher proportion of agricultural land and water use, and an absence of recycled water use.

5. DEFINITION OF BOLSA MANAGEMENT AREA

The Bolsa has long been recognized for its distinct topography and groundwater conditions, although its boundaries have been defined variously by USGS, DWR, and SBCWD. As shown in **Figure 1**, the Bolsa is a predominantly flat, relatively low-elevation area. It shares a watershed boundary with the San Juan MA and the Zone 6 boundary with the Hollister MA. It is the only MA bounding another groundwater basin, the Llagas Basin in Santa Clara County. It also differs from the adjacent Hollister and San Juan MAs by not having direct access to CVP imports or managed recharge from Hernandez and Pacines Reservoirs. It is outside of SBCWD's Zone 6 and Zone 3. Important characteristics of the Bolsa MA include the predominantly agricultural and rural land uses and complete reliance on groundwater supply provided through private wells.



Management Areas

North San Benito Basin

San Benito County

July 2019

TODD GROUNDWATER

Figure 1
Management Areas

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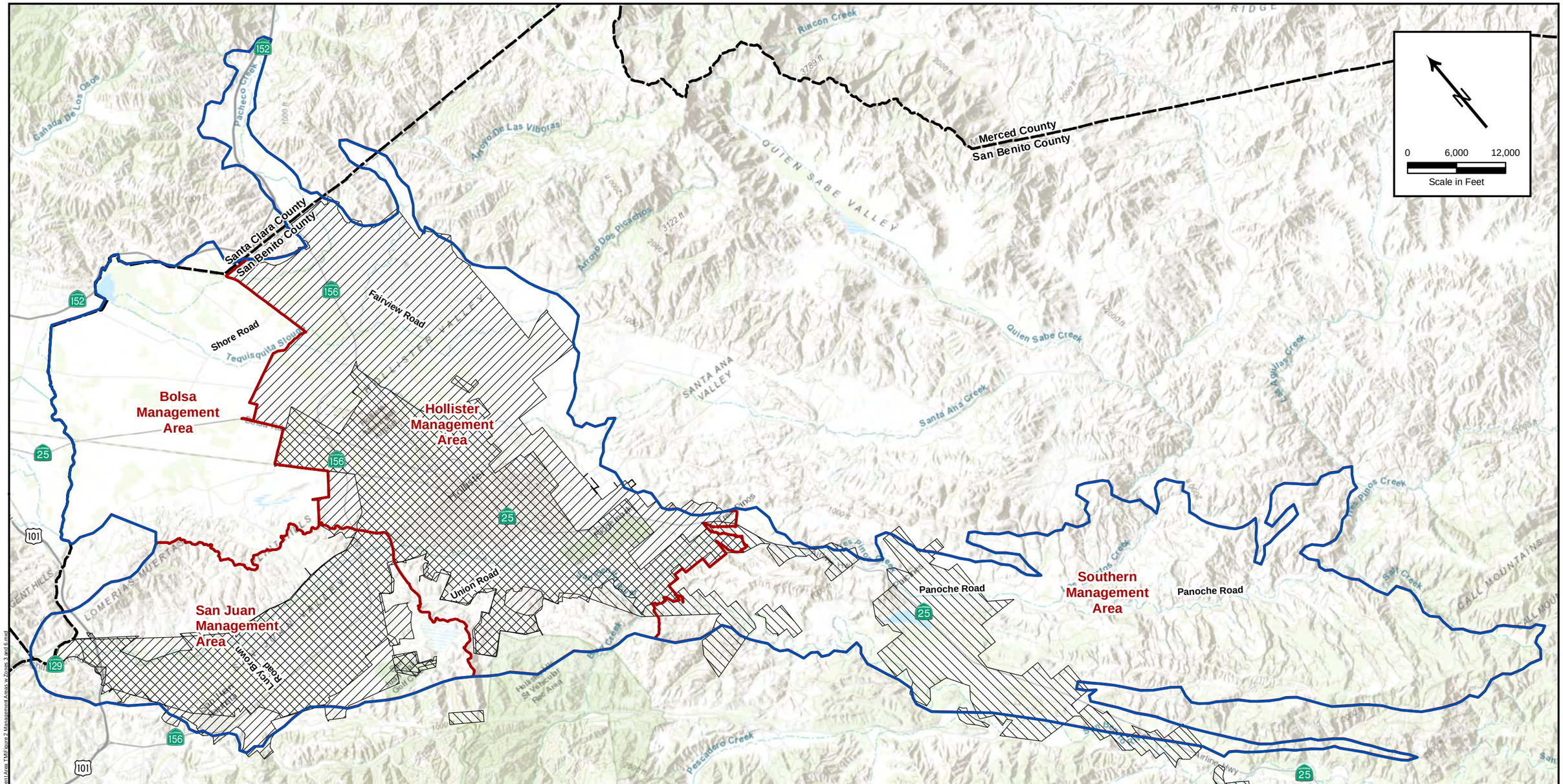

Management Areas

San Benito County Water District Zone 6

San Benito County Water District Zone 3

North San Benito Basin

San Benito County

July 2019

TODD GROUNDWATER

Figure 2
Management Areas and Zones of Benefit

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May 10, 2021

TECHNICAL MEMORANDUM

To: Jeff Cattaneo, GSP Project Manager
San Benito County Water District GSA

From: Maureen Reilly, PE, Chad Taylor, PG, CHG, and Iris Priestaf, PhD

Re: Data Management System (DMS)

1. EXECUTIVE SUMMARY

San Benito County Water District (SBCWD) and Santa Clara Valley Water District (SCVWD) are the Groundwater Sustainable Agencies (GSAs) for their respective service areas overlying the North San Benito Groundwater Basin (Basin). In accordance with the Sustainable Groundwater Management Act (SGMA), SBCWD and SCVWD are preparing a Groundwater Sustainability Plan (GSP) for the Basin. The purpose of this Technical Memorandum (TM) is to document the Data Management System (DMS) developed as part of the GSP.

SBCWD and SCVWD have a long history of groundwater management and data collection. These agencies regularly collect, assess, and report on groundwater conditions and these data are fundamental to the GSP. In addition, the California Department of Water Resource (DWR) has been developing state and regional data sets to help local agencies fill data gaps.

SBCWD has been collecting and compiling groundwater data annually including water levels, water quality, and water use for the GSP and Annual Groundwater Report. As part of the GSP, the data management system has been redesigned to be practicable, usable, intuitive, and cost effective. The data (and data from SCVWD and other sources) are being compiled in a relational database, which consists of an Access database, GIS geodatabase, and Excel workbooks. This DMS has capabilities for queries to quickly check and summarize data. This memo outlines the type of data available in the DMS and details how the data are stored. More information on available data is documented in the technical memorandum, “Data to Support GSP Preparation” (Todd 2018).

2. DMS TYPES AND SOURCES

Data collected and compiled for the GSP have been stored in a variety of formats based on the type of data collected. Spatial information such as ArcGIS files, aerial imagery, and or

other map sources, is stored in a Geodatabase. Tabular data collected are stored in subject-specific relational databases. Additional datasets are stored in files best suited for analysis. To be specific, climate data are stored in an Excel workbook to allow for cumulative departure calculations, scanned well documents are stored as images to preserve the detail on the hardcopy forms, and online datasets updated by other agencies are included by reference. Discussed below are the data formats and the type of data available within that format.

3. GEODATABASE

Spatial data are stored in two connected geodatabases, a general geodatabase and an ArcHydro geodatabase. A Geodatabase allows spatial files to be easily accessed and transferred with all appropriate spatial information. Within the North San Benito Geodatabases, consistent and progressive folder structures have been constructed to group associated data sets.

3.1 Jurisdiction Boundaries

The basin boundaries for the North San Benito Groundwater Basin, management areas, and zone of benefit designations are available as spatial coverages in the geodatabase. Other jurisdictional boundaries including city limits, spheres of influence, and county limits are also included. The Assessor Parcel map received from San Benito County is also included as a coverage.

3.2 Surface Water Body Location and Watershed Mapping

Mapping data for surface water features have been provided from publicly available sources. These mapped data include locations of aqueducts, reservoirs, rivers, streams, drainages, lakes, and ponds. These data are presented in the project geodatabase in feature classes named *HydrologyArcs,* and *HydrologyPolygons*. DWR defined watershed coverages are also stored in the ArcHydro geodatabase names *Watershed*.

3.3 Mapping of Natural Communities Commonly Associated with Groundwater

GSP Regulations require identification of Groundwater Dependent Ecosystems (GDEs), which are defined as ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. A statewide database and mapping tool, developed by DWR, provides geographic information on Natural Communities Commonly Associated with Groundwater (NCAAG). While these do not necessarily represent GDEs, the dataset is a starting point in identifying GDEs. The mapping data for watersheds surrounding the Basin are included in the project geodatabase in the *Hydrology* feature dataset in feature classes named *GDE_NCCAGWetlands* and *GDE_NCCAGVegetation*.

3.4 Ground Surface Elevation Data

Ground surface elevation data are available from the USGS in the form of National Elevation Dataset (NED) GIS grid files (rasters) and raster and vector topographic map datasets. Both datasets have been compiled for the area surrounding and including the Basin. The 10-meter resolution NED data have been combined into a single raster.

3.5 Aerial Photographs

Aerial photographs of the area surrounding the Basin have been downloaded from the USGS National Aerial Imagery Program (NAIP) for 2004, 2005, 2006, 2009, 2010, 2012, 2014, and 2016. These aerial photographs are all rectified GIS raster datasets and included in the project geodatabase.

3.6 Soil Maps

Soil information for the Basin and surrounding areas have been downloaded from the Natural Resources Conservation Service (NRCS, 2018). Soil data are mapped and maintained by NRCS in a standardized format that is compatible with tools that NRCS makes freely available to the public. The soils data for the area surrounding the basin have been maintained in the standard NRCS formats to facilitate future use. These raw data are available for preparation of a various soil data presentations and analyses. The hydrologic soil group data from these datasets have been also mapped using the NRCS *Soil Data Development Toolbox.* These data are in the *Soils* feature dataset in the project geodatabase.

3.7 Land Use Maps

Land use map data have been collected from DWR, the California Department of Conservation Farmland Mapping and Monitoring Program (FMMP), and counties of San Benito and Santa Clara. The available land use maps are indicated below:

- DWR: 2014 statewide land use mapping specifically developed for SGMA and GSPs.
- San Benito County: 1997 and 2002
- Santa Clara County: 2014
- San Benito County Water District Update: 2010
- FMMP: 1984, 1986, 1988, 1990, 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012, 2014, and 2016
- County Crop Reports
- Land Use and General Plans: County, Hollister, San Juan Bautista

3.8 Geologic Mapping of Surficial Geology and Faults

Surficial geology of the Basin has been mapped by the California Geological Survey (CGS) in the 2002 *Geologic Map of Monterey 30' x 60' Quadrangle and Adjacent Areas*. This mapped geology has been digitized into GIS formats available from the CGS, and these complete

datasets are included in the GSP geodatabase. In addition to this digital geologic map, there are also published geologic maps are available in other formats. These include the 1972 *Ground-Water Hydrology of the Hollister and San Juan Valleys, San Benito County* prepared by Kilburn (USGS) and numerous geologic maps for individual topographic quadrangles prepared by Brabb, Clark, Dibblee, and others and published by the USGS.

3.9 Subsidence - NASA JPL InSAR Dataset

Vertical ground surface displacement rates are derived from Interferometric Synthetic Aperture Radar (InSAR) data collected by the European Space Agency (ESA) Sentinel-1A satellite and processed by the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL), under contract with DWR. Changes in vertical displacement can be viewed through the DWR SGMA mapping tool. Data are downloaded from the SGMA data viewer annually and stored in the project geodatabase.

3.10 Subsidence - UNAVCO Continuous GPS Sites

Also available through the DWR SGMA mapping tool is the Continuous GPS (CGPS) stations and associated data. These stations continuously measure the three-dimensional (3D) position of a point on or near the earth's surface. For subsidence studies, vertical movement (subsidence and uplift) is most relevant; data on horizontal movement can help discern tectonic movement that is an important local factor. Data are downloaded from the SGMA data viewer annually and stored in the project geodatabase.

3.11 Imported Water Infrastructure

The locations of major imported water delivery pipelines (San Felipe, Hollister Conduit, and laterals) are included in the GIS datasets in the project geodatabase. The locations of Water Treatment Plants and wastewater facilities are also stored in the geodatabase.

3.12 Climate Data

The CIMIS stations and other climate locations are available in the geodatabase as a point coverage. In addition, the PRISM isohyets are available as a raster.

3.13 Surface Water Gage Locations

The locations of USGS surface water gages and locations of previous District surface water monitoring are also stored in the Geodatabase.

3.14 Well Records, Lithology, and Well Construction

Well records are included in the GIS datasets in the project geodatabases. This includes information for known and locatable wells in the Basin. Well completion reports for the entire Basin were requested and received from DWR on behalf of SBCWD. Appropriate confidentiality of well completion reports is being maintained per agreements among

SBCWD, SCVWD, and DWR. SBCWD has been the permitting agency in San Benito County since 2004 and maintains well records in addition to those available from DWR. SBCWD well record files include more information than the DWR records including borehole and well locations, construction, and use. SBCWD well files were scanned to support the GSP.

The well records from both sources have been reviewed and organized and data from these record sets are included in the project geodatabases. Boreholes and wells that could be readily located from geographic coordinates or assessor's parcel number (APN) were plotted and are included in the GIS datasets; this includes all wells from SBCWD well records that correspond to current APNs, those wells from SBCWD records that include latitude and longitude or other location coordinates, and those wells from DWR records that include location coordinates or other information making them locatable. As a note, wells with valid APNs were plotted at the centroid of the associated parcel. The remaining well records were further reviewed, and those that could be located now are recorded with location information.

All locatable wells were organized into GIS datasets compatible with the ArcHydro data structure for use in development of the hydrogeologic conceptual model, cross sections, and numerical model. Those wells close to planned cross section lines were further reviewed, and lithology and well construction information was digitized into GIS data tables using the ArcHydro data structure. These data were combined with other geologic and hydrogeologic information to prepare cross sections. Cross section datasets are also stored in the project geodatabases in the ArcHydro data structure. Compilation of this information is ongoing.

4. ACCESS DATABASES

Tabular data are linked in relational databases by subject. The DMS includes four stand-alone databases for groundwater elevation, groundwater quality, water use, and surface water monitoring. Each database, including locational information as State Plane coordinates, is updated annually.

4.1 Surface Water Database

4.1.1 Surface Water and Streamflow Data

Four streamflow gage stations are maintained in or near the Basin by the United States Geological Survey (USGS) with funding by SBCWD. These stations are located on San Benito River Near Willow Creek School (USGS 11156500), San Benito River at Hwy 156 Near Hollister Ca (USGS 11158600), Tres Pinos Creek Near Tres Pinos Ca (USGS 11157500) and Pacheco Creek Near Dunneville, CA (USGS 11153000). These stations are all active and have NWIS records that begin in October 1998, October 1988, October 1996, and October 2006, respectively. In addition, USGS maintains a gage on the Pajaro River at Chittenden, which is downstream of the confluence of the Pajaro and San Benito rivers; this gage has records extending back to 1939. Data for these stations are downloaded from the USGS annually and the database is updated.

Additional monitoring by the District will be used to update this database as appropriate.

4.2 Groundwater Elevation Database

The Groundwater Elevation Database includes relevant information about the wells and elevation data. The database is structured into tables with information on well location, well construction, and monitoring data. There are several queries designed to summarize and extract data for annual reporting.

4.2.1 Well Locations – Groundwater Elevation

Well locations for all wells with available water level data are included as a table in a relational database.

4.2.2 Well Construction – Groundwater Elevation

The database also includes a table or relevant well construction as available.

4.2.3 Groundwater Elevation Data

As with well locations, groundwater elevation records have been collected from multiple sources, including previous investigations, SBCWD, SCVWD, USGS NWIS, DWR CASGEM, and others. Data from these sources have been collected, reviewed, and compiled into a single unified groundwater elevation dataset. The database table is updated annually for the Annual Report.

4.3 Groundwater Quality Database

The groundwater quality database combines water quality data from a variety of sources for a comprehensive repository of regional water quality data. The relational database includes locations for all wells with water quality data, a table of water quality data, a table with information on the water system that was sampled, and a table of constituents monitored with agency codes, reporting levels, and applicable water quality goals. Queries are included to extract data on the key constituents of concern.

4.3.1 District Monitoring

SBCWD currently monitors a distributed network of 18 wells for water quality. Data from these monitoring wells and other water quality data are integrated into the comprehensive water quality database. District data are updated annually.

4.3.2 Regional Monitoring

In addition to District collected data, the comprehensive database includes available data from SBCWD, Regional Water Quality Control Board (including regulated facilities, wastewater plants, and spills), California State Water Resources Control Board (including municipal and small water systems, Tres Pinos Water District, City of Hollister, and Sunnyslope County Water District (SSCWD). In addition, data published as part of previous investigations have been added to the database. These datasets are updated triennially; recent updates occurred in 2013, 2016, and 2019.

4.3.3 Small Water System Wells

There are about 100 small water systems in the Basin, as defined by the State. The general location and number of wells are available from the State Water Resources Control Board Division of Drinking Water. A table of these systems, estimated population, and number of supply wells is in the database; this information is used for estimating water consumption. The California Environmental Health Tracking Program http://cehtp.org/water/map-viewer indicates the approximate location of 50 systems in San Benito County and one system in Santa Clara County. This information is tied to the reported water quality for these wells and updated triennially.

4.4 Water Use Database

Existing water use data for Zone 6 (both groundwater pumping and CVP deliveries) is stored in a relational database. In the future, groundwater use will be determined basin-wide, and this expansion and improvement of the monitoring program will include replacement of the existing power meter use in Zone 6. This database has been and will continue to be updated annually.

4.4.1 Production Wells/Pumping Data

Groundwater is pumped by private well owners for irrigation, industrial, and domestic uses and by public water supply retailers for municipal and small community purposes. As currently available, information for each well, type of user, water source, and meter number is included in the database.

The major municipal suppliers are the City of Hollister, Sunnyslope County Water District, and City of San Juan Bautista. All three agencies report their monthly pumping to SBCWD for publication in the Annual Groundwater Report. As of 2020, the City of Hollister has four active wells, Sunnyslope has five active wells, and San Juan Bautista has two active wells.

Estimates of agricultural pumping amounts are available for the Zone 6 portion of the Basin. SBCWD monitors the hours of operation of large wells in Zone 6 and converts hours of operation to production volume based on infrequent measurements of pump discharge rate. This approach is incapable of accounting for changes in pump discharge pressure (for sprinkler versus furrow irrigation, for example) or seasonal and interannual changes in static depth to water. Hours of pump operation are recorded on a semi-annual basis. This information is included in the database. Pumping in areas outside of Zone 6 is not metered as of 2021.

4.4.2 Imported Water

SBCWD and SCVWD manage the imported water from the Central Valley Project (CVP) for their respective service areas. Imported water data volumes, uses, and locations of delivery are documented by SBCWD for Zone 6 and included in the project database. The volumes of imported water delivered to municipal sources, agricultural uses, managed recharge, and evaporative losses are recorded monthly. Locations of major imported water delivery pipelines are included in the GIS datasets in the project geodatabase.

SCVWD delivers some imported water to portions of the Basin in Santa Clara County. SCVWD provided semiannual delivery volumes for the two customers in the GSP area.

4.4.3 Recycled Water and Wastewater

The City of Hollister produces recycled water for irrigation purposes, including landscape irrigation in the City's Riverside (Brigantino) Park. SBCWD provides delivery of recycled water to nearby agricultural customers. Delivered amounts and distribution locations are included in the water use database.

5. OTHER FORMATS

5.1 Climate Data (precipitation, evaporation, temperature) - Excel

Climate data are compiled and stored as an Excel file. The workbook also calculates the cumulative departure of precipitation and local water year type by quintiles.

A key data source is the California Irrigation Management Information System (CIMIS), which is a program unit within DWR that manages a network of more than 145 automated weather stations in California. This network is designed to assist irrigators in managing their water resources more efficiently. The two stations in the Basin are:

- Station #126 located in Hollister with available data from 6/9/1994
- Station #143 located in San Juan with available data from 1/1/1998

5.2 Soil Index

The Soil Agricultural Groundwater Banking Index (SAGBI) is a suitability index for groundwater recharge on agricultural land, for example, water spreading in dormant orchards or on fallow land. The SAGBI is based on five major factors for managed aquifer recharge on agricultural lands: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition. The coverage is available through an online web tool by the California Soil Resource Lab at UC Davis and UC-ANR and DWR https://gis.water.ca.gov/app/cadwrlanduseviewer/.

6. DATA MANAGEMENT STORAGE

The DMS will continue to be updated with more recent data for annual reports and the GSP 5-year update. It is expected that new datasets will be added as projects and management actions are enacted to fille data gaps. For example, remote sensing raster files and tabular data will be added to quantity basin-wide water use.

The geodatabase, Access databases, and excel workbooks are updated annually as part of the Annual Report. The District will maintain a copy of the annually updated files.

APPENDIX F

Annual Groundwater Reports

- Annual Groundwater Report WY 2015
- Annual Groundwater Report WY 2016
- Annual Groundwater Report WY 2017
- Annual Groundwater Report WY 2018
- Annual Groundwater Report WY 2019
- Annual Groundwater Report WY 2020

2015

San Benito County Water District

Annual Groundwater Report

TODD GROUNDWATER

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ANNUAL GROUNDWATER REPORT

WATER YEAR 2015

DECEMBER 2015

TODD GROUNDWATER

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WATER YEAR 2015

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ES EXECUTIVE SUMMARY

PURSUING SUSTAINABILITY

This Annual Groundwater Report for San Benito County Water District (District) describes groundwater conditions in the San Benito County portion of the Gilroy-Hollister basin. It documents water supply sources and uses, groundwater levels and storage, and District management activities for water year 2015. Recommendations are provided with regard to groundwater replenishment, pumping, and the amount of water to import for water year 2016.

The 2014 Sustainable Groundwater Management Act (SGMA) continued to develop in 2015 with clarifications to the law through Senate Bill 13 (effective January 1, 2016) and through development of regulations by the Department of Water Resources (DWR). In brief, SGMA requires sustainable groundwater management for designated medium- and high-priority groundwater basins[1], including in San Benito County. Much SGMA activity this year has focused on defining groundwater basin boundaries as the physical basis for management, establishing Groundwater Sustainability Agencies (GSAs), and laying the groundwork for Groundwater Sustainability Plans (GSPs). The special section of this year's report addresses initial steps in this process, basin boundary modification and GSA formation. Boundary-specific actions are recommended for the District; it is recommended that the District establish itself as GSA for medium-priority subbasins in San Benito County.

Groundwater use increased this year as available imported water was limited. Groundwater represented 86 percent of total supply, mostly for agricultural use. The result of the increased groundwater use was continued groundwater level decline throughout much of the basin's agricultural area, specifically San Juan Subbasin.

Water levels continue to decline in San Juan, Hollister West, Bolsa SE, and Tres Pinos subbasins but remain above historical lows. The San Juan subbasin continues to rely on groundwater use to offset limited supplies of imported water. Since the beginning of this multiple year drought in 2012, groundwater levels have decreased as much as 38 feet in parts of the subbasin and on average 28 feet decline across the subbasin. Management activities to facilitate recovery should target areas with the most significant declines.

Precipitation in water year 2016 is expected to be above average but that alone is unlikely to be sufficient for full recovery from the multiple year drought. Additional wet years with snowpack in the Sierra and responsive water conservation (among other factors) will be needed before imported water supplies are replenished and depleted groundwater storage is recovered.

[1] Except when specified, "basin" is used generally to include basins and subbasins.

1 INTRODUCTION

The San Benito County Water District (District) was formed by a special act of the State with responsibility and authority to manage groundwater. The special act allows the Board of Directors to require an annual groundwater report and, as documented in Appendix A, specifies the minimum content of the report should the District choose to prepare one. The District, at its discretion, has also directed that specific Annual Reports include focused discussion of selected topics; this year, the focused topic is the Sustainable Groundwater Management Act (SGMA). This 2014 legislation mandates sustainable management for high and medium priority basins, including several in San Benito County. This Annual Report, prepared at the request of the District, documents water supply sources and use, groundwater levels and storage, and District management activities from October 2014 through September 2015.

It is intended to present an overview of the state of the groundwater basin. It also conveys considerable information, including tables and figures, which are provided largely in Appendices B through E. Appendix F provides information on water rates and charges, Appendix G provides information on drought recovery, and Appendix H is a list of acronyms.

Throughout this report, water volumes and changes in storage are shown to the nearest acre-foot (AF). These values are accurate to one to three significant digits (depending on the measurement). All digits are retained in the text to maintain as much accuracy as possible during subsequent calculations, but results should be rounded appropriately.

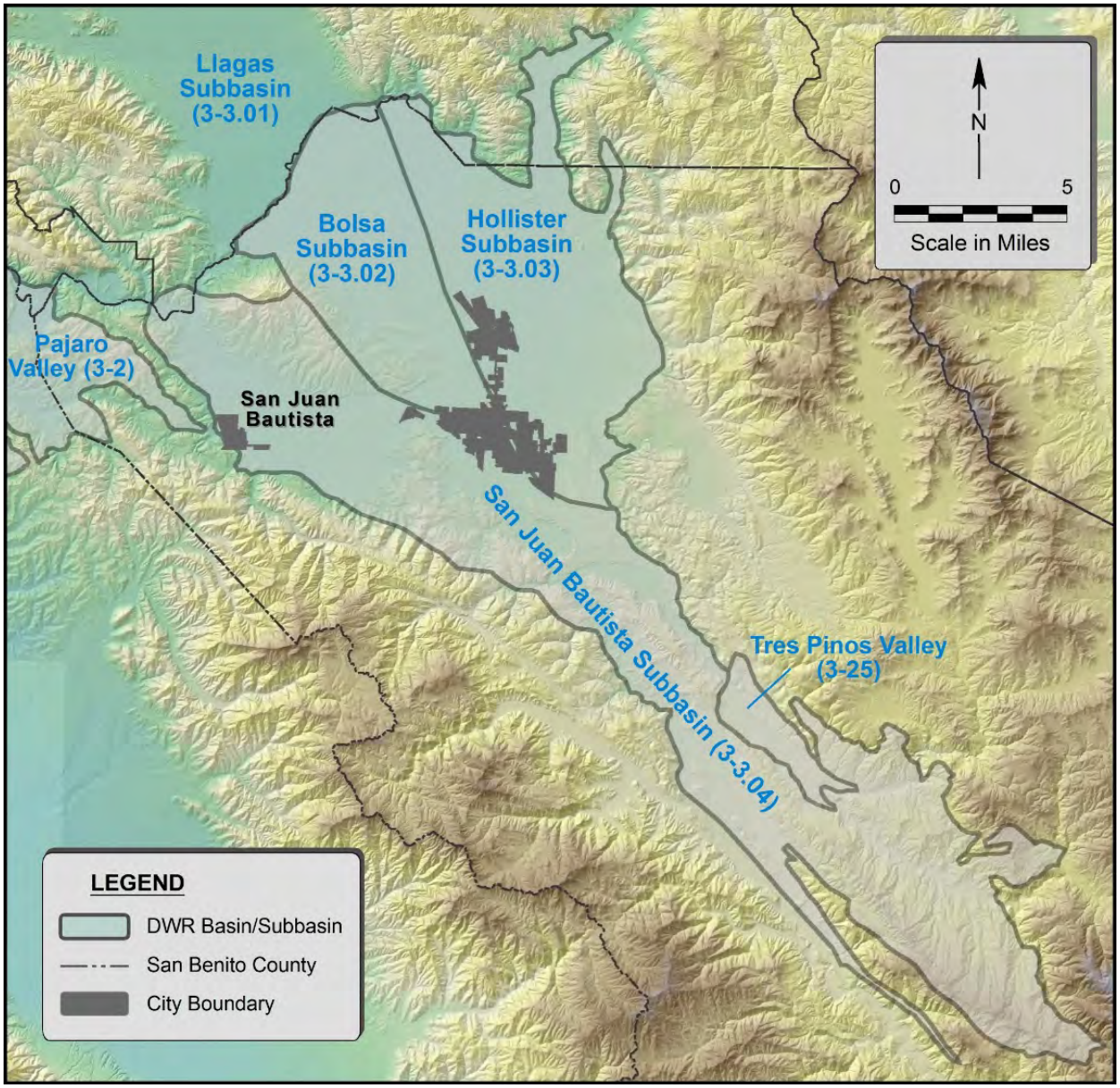
Acknowledgments

This report was prepared by Iris Priestaf, PhD, Maureen Reilly, PE, Chad Taylor, PG, CHg, and Gus Yates, PG, CHg of Todd Groundwater. We appreciate the assistance of San Benito County Water District staff, particularly Jeff Cattaneo and David MacDonald.

Geographic Areas

This report focuses on the northern San Benito County portion of the Gilroy-Hollister groundwater basin (**Figure 1**), which extends into southern Santa Clara County. The San Benito part of the basin encompasses the City of Hollister, City of San Juan Bautista, unincorporated residential areas, and expansive areas of irrigated agriculture. The Department of Water Resources (DWR) originally defined the Bolsa, Hollister, and San Juan Bautista Subbasins largely on geology. DWR is accepting requests to revise groundwater basin boundaries. Section 3 discusses the current boundaries and possible revisions in detail.

Figure 1. DWR Defined Basins and Subbasins.



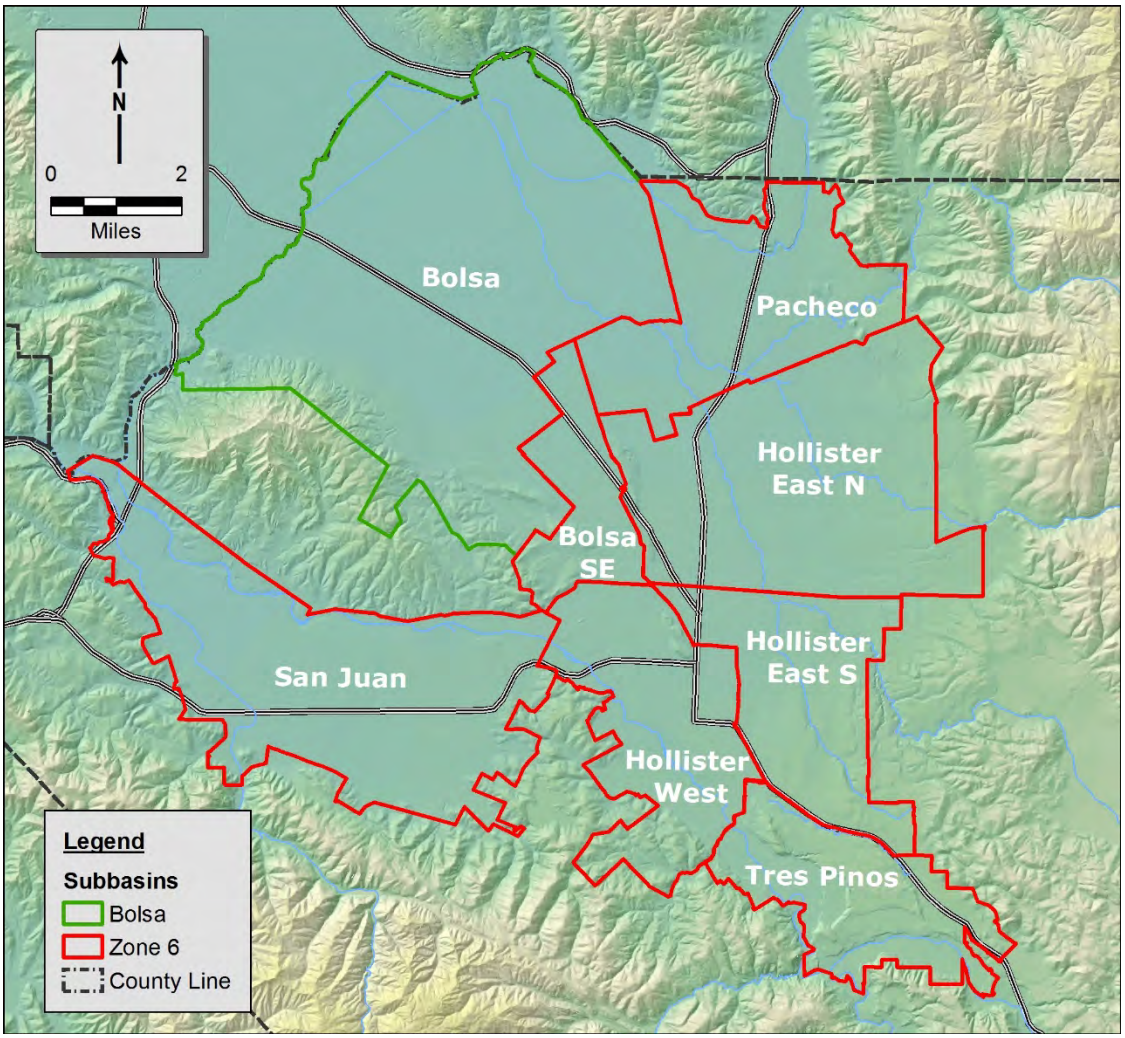
The District currently manages water resources, and groundwater in particular, using different geographic areas. It focuses its management on three Zones of Benefit, listed in Table 1. For the purposes of District groundwater management and annual reporting, seven subbasins were delineated in 1996: Bolsa, Bolsa Southeast (SE), Pacheco, Hollister East (North and South), Tres Pinos, Hollister West, and San Juan subbasins (**Figure 2**). These subbasins were defined based on hydrogeologic and significant local factors (i.e., Zone 6 boundaries) and used effectively for management and data collection for the past 19 years. They differ from the subbasins defined by DWR and identified for compliance with the Sustainable Groundwater Management Act. Of the subbasins shown on Figure 2, only the Bolsa subbasin receives no CVP deliveries and relies entirely on local groundwater.

Future GSA formation and development of GSPs will be accomplished in terms of DWR defined basins and subbasins, discussed in Section 3. For GSPs and other future reporting, the groundwater data may need to be collected and presented for management areas consistent with DWR defined basins.

Table 1. District Zones of Benefit

Zone	Area	Provides
1	Entire County	Specific District administrative expenses
3	San Benito River Valley (Paicines to San Juan) and Tres Pinos River Valley (Paicines to San Benito River)	Operation of Hernandez and Paicines reservoirs and related groundwater recharge and management activities
6	San Juan, Hollister East, Hollister West, Pacheco, Bolsa SE, and Tres Pinos subbasins	Importation and distribution of CVP water and related groundwater management activities

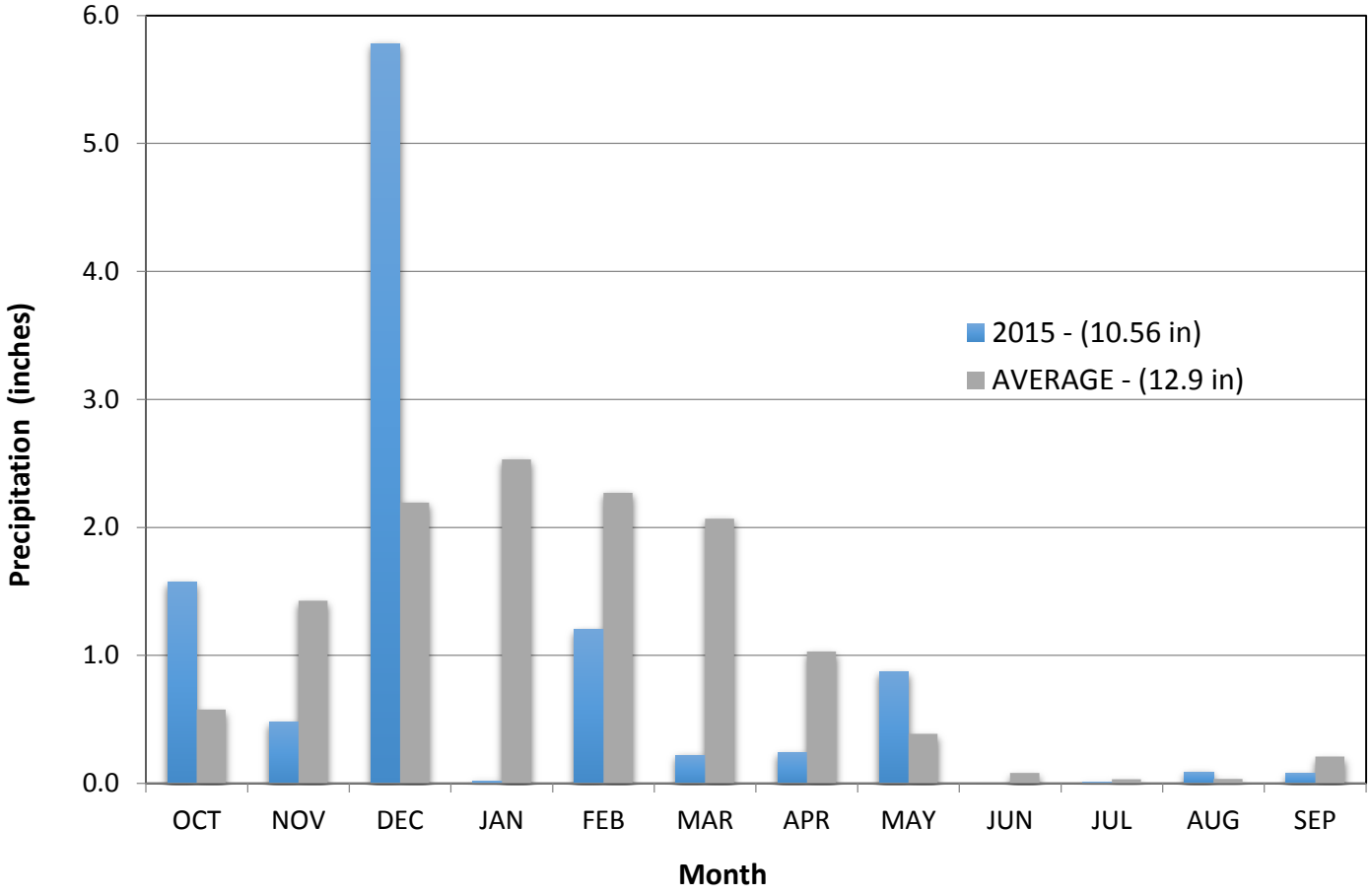
Figure 2. Locations of SBCWD Subbasins



Hydrologic Conditions

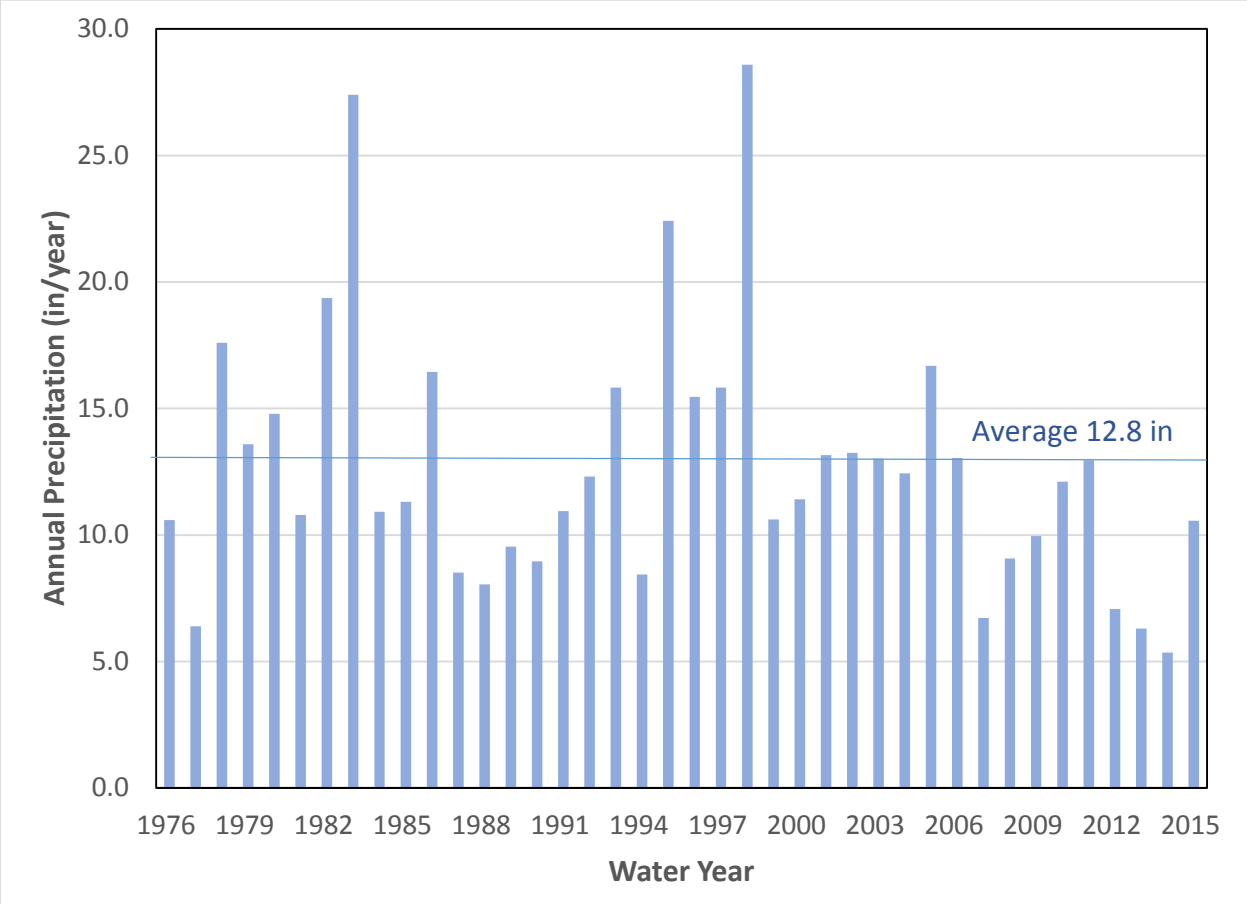
Local rainfall—wet and dry years—is one driver of hydrologic conditions in the basin, affecting volumes of certain basin inflows (e.g., deep percolation) and outflows (groundwater pumping). Dry years also may be characterized by reduced CVP allocations (recognizing that drought often is extensive across California) and some increase in agricultural irrigation (to offset lack of rainfall); both of these factors can result in increased groundwater pumping. In 2015, overall precipitation was 10.56 inches (**Figure 3**), which is below the long term average (1875-2015) of 12.8 inches but higher than the last three years. Over half the rainfall fell in December as a result of a few large storms. The intensity of such events tend to result in more runoff and less groundwater percolation than more moderate rainfall. January was unusually dry: zero rainfall. This suggests that storms have been more variable and seasonal patterns are less predictable.

Figure 3. Monthly Precipitation in Water Year 2015



Water year is the fourth year of a multiple year drought, where annual precipitation has been less than the long term average. Over the last nine years, annual precipitation in only one year (2011) has equaled the long term average. As shown in **Figure 4**, the average annual precipitation over the past nine years has been significantly less than the long term average (1875-2015). Relative to historical droughts (see also Appendix B), the recent drought has been prolonged (compare to drought of 1987-1992) with the exception of 2011 and relatively extreme (compare 2014 to 1977). Recovery of groundwater levels from previous droughts was accomplished with management activites using available imported water and recharge of local surface water.

Figure 4. Annual Precipitation (1976-2015)



2 MANAGEMENT ACTIVITIES

The District is active in water management activities including water resources planning, water conservation, development of additional water sources, augmentation of groundwater resources, and distribution of CVP water. The District also maintains a comprehensive monitoring program, including regular measurement of groundwater pumping, annual evaluation of groundwater storage change, and assessment of regional water quality.

Water Resources Planning

In 2015, the District was engaged in various projects, programs and planning efforts that address water supply, water quality, and wastewater management. Most of these activities are focused on how to maximize CVP deliveries when available or to develop supplies for use when CVP imports are not available. It is expected that the recent variability in CVP allocations will continue in the future because of climate change and environmental policy.

- **Lessalt Treatment Plant Upgrade.** The Lessalt Water Treatment Plant (WTP) was built in 2003 to treat CVP imports for urban use. As of 2015, the plant has been upgraded to treat an average of 2MGD (2,240 AFY).

- **West Hills Water Treatment Plant**. The second surface water treatment plant to treat CVP imports (for delivery to urban areas currently not served by the Lessalt WTP) has begun construction. The plant is located at the West Hills Site, near the San Juan subbasin north of Union Road. It is designed to treat an average annual capacity of 3 MGD (based on a 4.5 MGD design capacity).

- **North County Groundwater.** In addition to development of local surface water supplies, the Master Plan also identified north county groundwater subbasins as sources of long-term supply. Current planning suggests the North County could produce an additional 1,400 AFY to 2,000 AFY in the near future.

- **Recycled Water Project**. Additional distribution systems will be added to the City of Hollister Reclamation facility, expected to begin in late 2015. This system will increase the use of recycled water in the District. Recycled water will augment supply to agricultural users in the Hollister subbasin area.

- **Ongoing Planning.** The Hollister Urban Area (HUA) is currently working on two water supply planning documents, the HUA Master Plan Update and the HUA Urban Water Management Plan (UWMP). The documents are expected to be complete by July 2016.

- **Sustainable Groundwater Management Act**. SGMA, the most significant groundwater legislation in California history, requires sustainable management by local agencies. The subbasins of the Gilroy-Hollister Basin must have Groundwater Sustainability Plans in place by 2022.The District may take on the role of Groundwater Sustainability Agency. Section 3 of this report provides a detailed look at what that entails.

Water Conservation

Water conservation is an important tool to manage demands on the groundwater basin. During this multiple year drought, the state has mandated water retailers to reduce their demand. This state-ordered demand reduction, together with the expansion of ongoing water conservation efforts, has successfully lowered water demand. Water conservation efforts in San Benito County are conducted mostly through the Water Resources Association (WRA), composed of representatives from the District, City of Hollister, City of San Juan Bautista, and Sunnyslope County Water District (SSCWD).

State Mandated Conservation. On April 1, 2015, Governor Brown issued an Executive Order mandating water reductions in urban areas to reduce potable urban water usage by 25 percent statewide. The City of Hollister and SSCWD are required to submit their monthly water demand reduction accomplishments to the State Water Resources Control Board. For example, as of September 2015, the City of Hollister and Sunnyslope reduced 26.4 and 36.2 percent from 2013 water use, respectively, surpassing the mandated conservation. The reduced municipal demand is shown on Figure E-5 in Appendix E.

Water Softener Rebate Programs. Since 2008, a program has been in place to issue rebates to those water customers who remove a SRWS without replacement ($300) or with transition to an off-site exchange service ($250). In July of 2014, the City of Hollister enacted an ordinance that prohibits the installation of self-regenerating water softeners (SRWS) that use sodium and/or potassium salts.

Irrigation Education. The District, in collaboration with the WRA, has been offering a series of classes since 2009 on irrigation efficiency and other agriculture practices.These workshops provide concepts, tools, and examples for optimizing irrigation and nitrogen management efficiency in row, tree, and greenhouse crop production. The classes also focus on keeping records and acquiring data needed for water quality regulation and reporting. The WRA also offers classes to residential customers. These classes instruct customers on topics such as: efficient irrigation practices, converting landscapes to be water wise and composting.

Water Efficient Landscape Plans. The WRA website provides three sample Water Efficient Landscape Plans available for download. The themes include dry creek, strolling, and meadow. These plans help show residential users ways to make their landscape appealing and efficient. In addition, WRA provides other residential landscape information such as lawn guides, and a water wise garden brochure.

Turf Removal Program. In July 2014 the WRA added a Turf Removal Program to encourage customers to remove high water use turf areas from residential parcels. This program complements the irrigation hardware rebates and free water efficient landscape plans. In Fiscal Year 15/16 the program expanded from offering a $1 per square of turf removed up to 500 square feet to 1,000 square feet. The only land cover allowed in the area where the turf is removed includes: drought tolerant or native plants, permeable hardscapes and/or a combination. As of November 2015, over 88,000 square feet of turf have been removed in the Hollister Urban Area.

Other ongoing water conservation programs include:

"Promoting The Efficient Use of Water"

- Irrigation rebate program
- Green Business Committee
- Home water survey program
- Toilet replacement program
- High-efficiency clothes washer program
- Education program (classroom presentations, fieldtrips to reclamation plant and water treatment plant, Ag in the Classroom, Farm Day)
- Outreach programs including ads in local newspaper, bill inserts, newsletters, San Benito County Fair, Water Awareness Month (May), Water-wise demonstration garden, water conservation library for public use, WRA website, and web and print ads in the Hollister Free Lance newspaper and website.

These ongoing water conservation programs have successfully reduced water demand in the basin. However, some of these measures may be reaching saturation. For example, the number of remaining toilets eligible for rebates are limited, as many residents have already installed low flow toilets. It is important to continue and diversify these plumbing and landscape conversion programs and public outreach to encourage the public to continue to use water wisely.

Managed Percolation

Percolation of Local Surface Water. In most years, local surface water released from Hernandez and Paicines Reservoirs is percolated along the San Benito River and Tres Pinos Creek. Releases of local surface water have been limited typically to percolation upstream of the confluence of San Benito River and Tres Pinos Creek. This has helped maintain groundwater levels without causing shallow groundwater problems and competing for available storage space with the City of Hollister wastewater percolation ponds.

This year, for the second year in a row, both Paicines and Hernandez were dry for the entire year because of ongoing drought conditions; there were no releases from either reservoir.

Percolation of Wastewater. Wastewater is percolated by the City of Hollister at its Domestic and Industrial plants, and is also percolated at the SSCWD Ridgemark Facilities and by Tres Pinos Water District. Recent changes in operation of the wastewater facilities have decreased the volume percolating to the groundwater. Information about the amount of groundwater recharged from these wastewater facilities is found in Appendix D.

Percolation of CVP Water. In the past, CVP percolation was used to recharge the groundwater basin. CVP percolation peaked in 1997 and was reduced subsequently in response to the successful recovery of the groundwater basin from overdraft. Direct in-stream recharge of CVP water is not expected to occur because of concerns for release of invasive Dreissenid mussels. A table of historical percolation is found in Appendix D.

3 SUSTAINABLE GROUNDWATER

The Sustainable Groundwater Management Act (SGMA) of 2014 provides a process and timeline for sustainable management of groundwater basins by local agencies, such as San Benito County Water District. SGMA applies to groundwater basins or subbasins designated by DWR as high- or medium priority, such as the Hollister, San Juan Bautista, and Bolsa subbasins. It requires establishment of one or more Groundwater Sustainability Agencies (GSAs) that encompass a basin or subbasin, development of one or more Groundwater Sustainability Plans (GSPs), and achievement of groundwater sustainability within 20 years.

This section summarizes a timeline for compliance with SGMA, along with the District's current plan for Annual Groundwater Reports, and potential District actions. It also presents an overview of key provisions of the SGMA with a focus on initial steps for revising or accepting DWR basin boundaries and for becoming a GSA. Potential funding also is discussed.

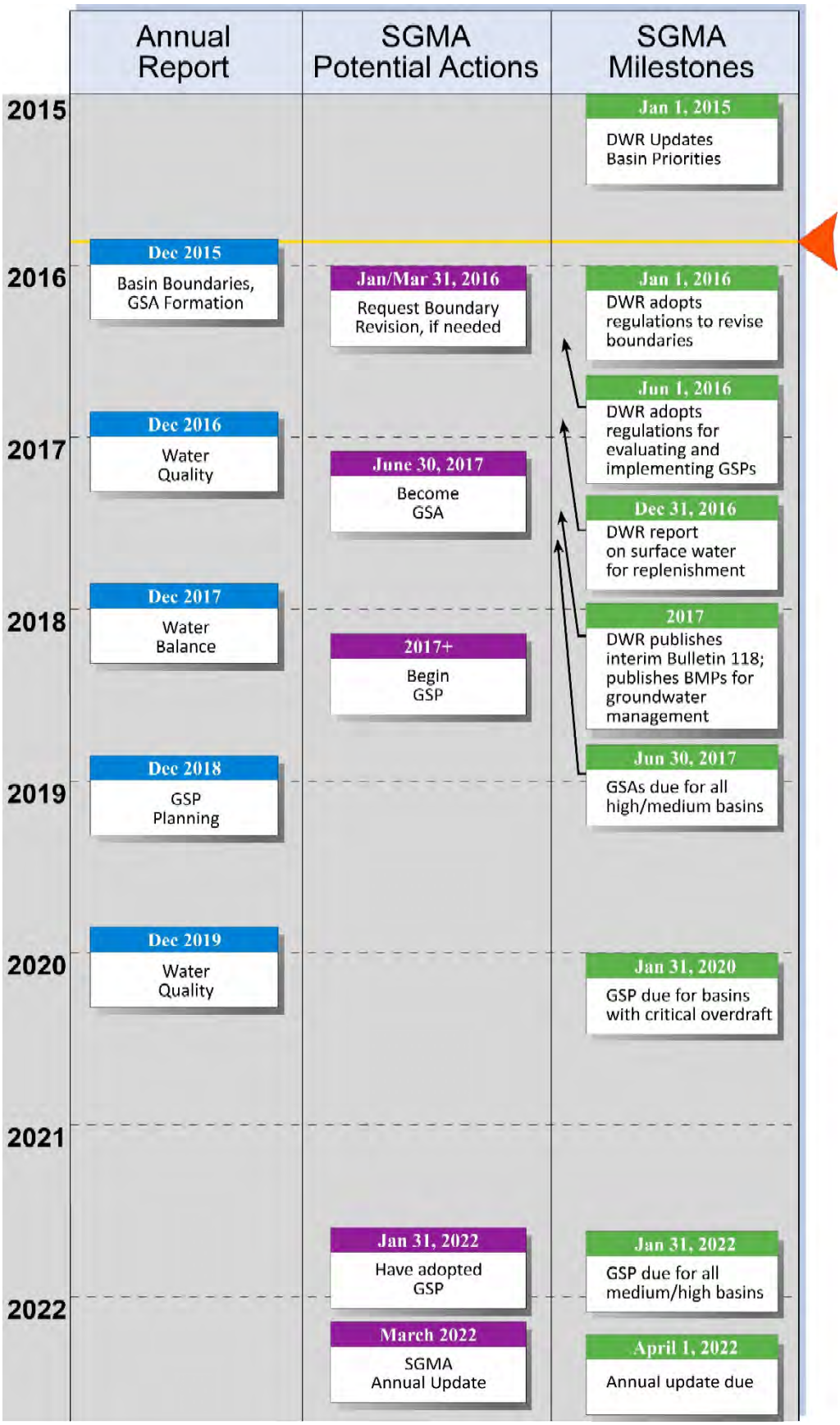
Timeline

The next page presents a timeline from 2015 to 2022. The left column describes the sequence of the District's Annual Groundwater Reports, the right column presents key milestones for compliance with SGMA, and the center provides potential District actions.

The timeline begins in 2015; the first SGMA milestone was DWR's update and finalization of the basin priorities by January 31, 2015. As anticipated in the 2014 Annual Report, there were no priority changes for local basins.[2] In the left column, this 2015 Annual Report addresses issues concerning basin boundaries. As of December 2015, DWR has developed draft regulations for agencies to request basin boundary revisions. These regulations become law on January 1, 2016, at which time a 90-day window opens (through March 31, 2016) during which local agencies can submit a basin boundary modification request. In the future, other such request periods will be scheduled.

Precise definition of basin boundaries (and areas) is important because these are the areas within which a GSA manages (and assesses fees). This 2015 Annual Report also addresses GSA formation; as illustrated on the timeline, this is required by June 30, 2017. A GSA (or conceivably more than one) is required to encompass the Hollister, San Juan Bautista, and Bolsa subbasins, as is one or more GSPs, which can be prepared thereafter (illustrated on the timeline in 2018) and completed by January 31, 2022.

[2] For the sake of brevity, the term "basin" is used generally to include basins and subbasins, except when a specific subbasin is mentioned.


Annual Report
SGMA Potential Actions
SGMA Milestones
2015
2016
2017
2018
2019
2020
2021
2022
Jan 1, 2015
DWR Updates Basin Priorities
Dec 2015
Basin Boundaries, GSA Formation
Jan/Mar 31, 2016
Request Boundary Revision, if needed
Jan 1, 2016
DWR adopts regulations to revise boundaries
Jun 1, 2016
DWR adopts regulations for evaluating and implementing GSPs
Dec 2016
Water Quality
June 30, 2017
Become GSA
Dec 31, 2016
DWR report on surface water for replenishment
Dec 2017
Water Balance
2017+
Begin GSP
2017
DWR publishes interim Bulletin 118; publishes BMPs for groundwater management
Jun 30, 2017
GSAs due for all high/medium basins
Dec 2018
GSP Planning
Dec 2019
Water Quality
Jan 31, 2020
GSP due for basins with critical overdraft
Jan 31, 2022
Have adopted GSP
Jan 31, 2022
GSP due for all medium/high basins
March 2022
SGMA Annual Update
April 1, 2022
Annual update due

The next Annual Reports are scheduled, as shown, to provide the regular triennial updates on water quality and the water balance. These 2016 and 2017 efforts (water quality and water balance respectively) will provide basic technical information to support the preparation of a GSP that may begin in 2018. As shown in the right column, at the same time (2016 and 2017), DWR will provide support for SGMA by publishing regulations for GSPs, reports on available surface water for replenishment, and regulations on best management practices.

Affected Basins

Under SGMA, DWR has ranked all California groundwater basins identified in DWR Bulletin 118 (DWR 2003) as very low, low, medium or high priority. Prioritization criteria include factors such as number of public supply wells, total wells, irrigated acreage, population, reliance on groundwater, impacts on streamflow and habitat, and occurrence of problems (e.g., overdraft, seawater intrusion, and subsidence). A medium- or high-priority basin has State-wide importance, but may or may not be in trouble. In addition, a low- or very-low priority basin may or may not have problems; moreover, its ranking is not intended to downplay its local significance. Rankings will be updated regularly; the next update will occur after basin boundaries are finalized in 2016.

SGMA compliance for low and very-low priority basins is not required, but an overlying water or land use agency may volunteer to be a GSA and prepare a GSP. Very low rankings were assigned to the Santa Ana, Upper Santa Ana, Quien Sabe, Tres Pinos, San Benito River, Dry Lake, Bitter Water, Hernandez, Panoche, and Vallecitos valley basins (see Figure C-1 for locations).

The Hollister, San Juan Bautista, and Bolsa subbasins of the Gilroy-Hollister Basin have been ranked as medium priority and thus are subject to SGMA. In addition, the Llagas subbasin of the Gilroy-Hollister Basin (Santa Clara County) has been designated as high priority, and the Pajaro Valley Groundwater Basin (which overlaps Santa Cruz, Monterey, and San Benito counties) has been deemed high priority. Moreover, the Pajaro Valley Groundwater Basin has been designated as critically overdrafted. This has important ramifications for GSP preparation and implementation; specifically, GSPs for such overdrafted basins must be adopted with implementation underway by 2020 (two years early) and sustainability must be achieved by 2040.

Basin Boundaries

Boundaries for all California groundwater basins have been defined by DWR, mostly based on geology, particularly contacts between unconsolidated sediments (e.g., alluvium) and lower-permeability geologic formations outside the basin, or geologic features like faults. Subbasin boundaries may also include jurisdictional boundaries such as county lines.

As noted in the 2014 Annual Report, some of the basin boundaries (as delineated by DWR) present hydrogeologic or governance issues. For example, the boundary dividing the Gilroy-Hollister Valley Basin between the Llagas and Bolsa/Hollister subbasins does not coincide neatly with the San Benito-Santa Clara county line. As a result, small portions of the Bolsa and Hollister subbasins extend into Santa Clara County where the District has no jurisdiction. Similarly, small marginal areas of the Llagas subbasin lap into San Benito County.

SGMA provides for basin boundary adjustments, some of which have been initiated already by DWR. In 2015, DWR began to realign some digitally-mapped (GIS) boundaries of basins to more accurately correspond with the original written descriptions in DWR Bulletin 118. These linework improvements mostly pertain to county lines and updated river locations, mostly in the Central Valley, but also include some of the above-mentioned subbasin boundaries along the Pajaro River and San Benito-Santa Clara county line.

In addition, local agencies may request that DWR revise the boundaries of a basin, including establishing new subbasins. Draft regulations for basin boundary revisions were developed by DWR through a public process in 2015 and the resulting Basin Boundary Emergency Regulation provisions went into effect on November 16, 2015. In brief, the regulations describe:

- The authority and intent of the regulations
- Definitions for key terms
- Description of Boundary Modification Categories, including scientific (based on geologic or hydrologic conditions) and jurisdictional (involving addition, deletion, or relocation of a boundary that promotes sustainable groundwater management)
- Procedures for modification requests and public input
- Description of the required information to support the proposed modification
- Methodology and criteria for evaluation by DWR
- Procedures for the adoption by DWR of boundary modifications.

The regulations are extensive and detailed, and description is beyond the scope of this report. Nonetheless, some fundamentals are noted below:

- Basin boundaries are defined by the written description in Bulletin 118 (until revised)
- An entire basin/subbasin must be covered by a GSA and GSP (or multiples of each) to avoid being designated as probationary and thereby risking State intervention
- Any proposed changes must be demonstrated to support sustainable management in the proposed basin and to avoid adversely affecting achievement of sustainability in adjacent basins.

DWR has developed an extensive, interactive and evolving website for SGMA that provides substantial information and multiple tools, both for local agencies and for the public and stakeholders. Selected links to the website are provided at the end of this section.

As noted previously, boundary modification requests can be made between January 1 and March 31, 2016; these will be reviewed by DWR and if approved, the changes will be published in the next version of Bulletin 118 (in 2017) and will be ready for the remainder of the SGMA process, in other words, GSA formation and GSP development.

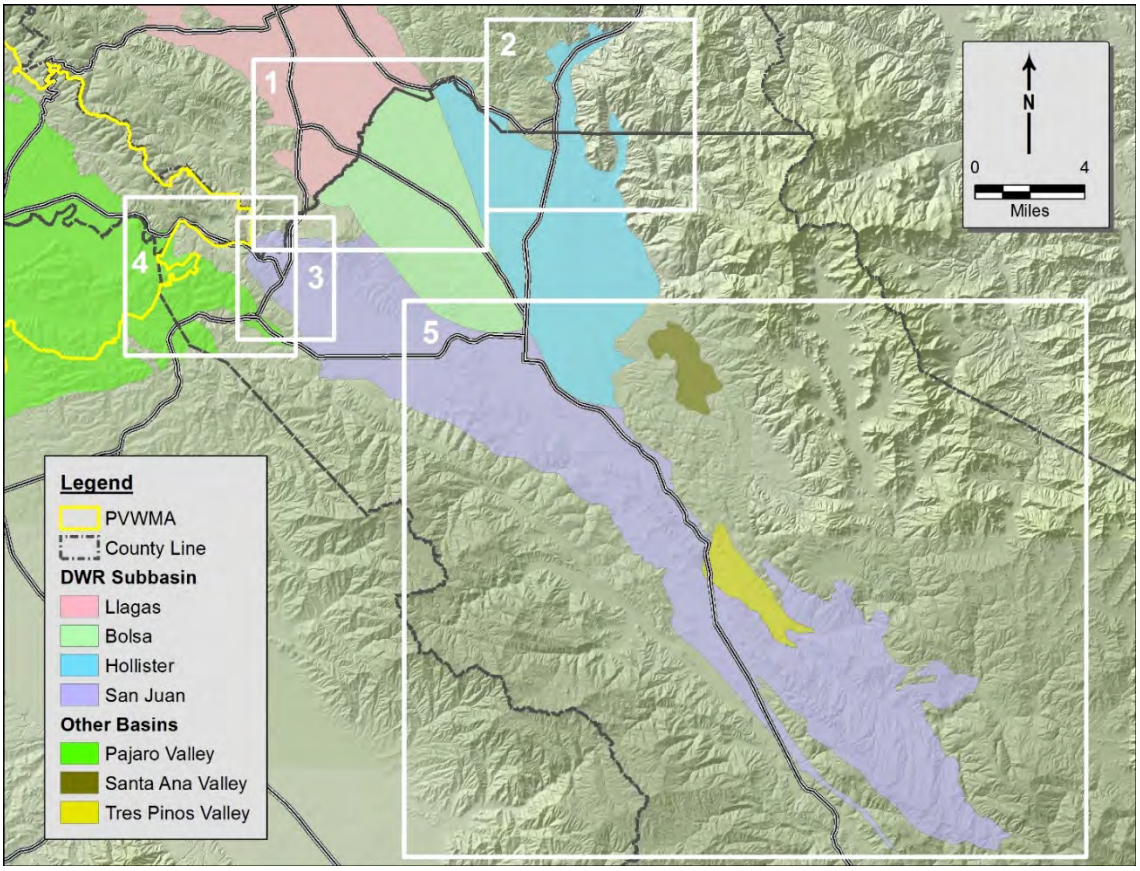
Local Basin Boundary Issues

Local basin boundaries were examined for this Annual Report in order to identify any issues that might prompt a basin boundary modification request. This involved application of existing GIS information to delineate the relevant, sometimes intertwined boundaries, including mapped boundaries related to Bulletin 118, local subbasins defined in 1996 and used in Annual Reports since then, plus county and water agency boundaries.

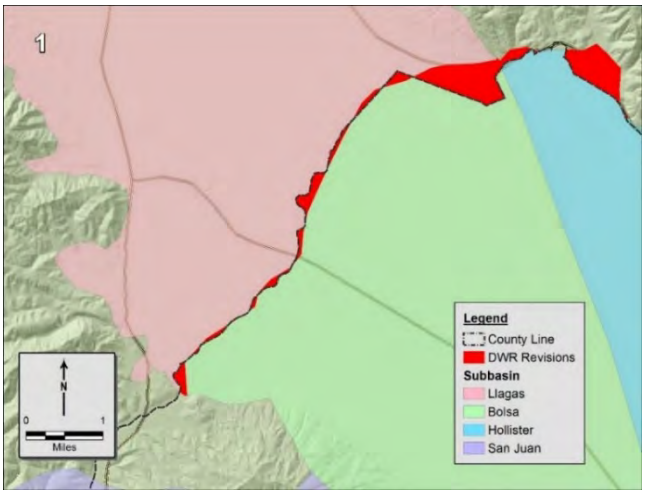
Background information also was reviewed. Various geologic maps were examined with regard to Bulletin 118 mapped boundaries in order to establish the provenance of Bulletin 118 boundaries and consider their accuracy and usefulness for District management purposes. The written descriptions in Bulletin 118 also were reviewed, recognizing their primacy in defining boundaries. In addition, the factors used in establishing the local 1996 subbasins were reviewed, as was a subsequent review of local boundaries (Yates, 2006).

The review focused on the medium- and high-priority groundwater basins/subbasins in and adjacent to northern San Benito County, which are subject to SGMA. This review identified five potential areas of concern; these are indicated on **Figure 5** and discussed below in numerical order.

Figure 5. Areas of Potential Boundary Concerns



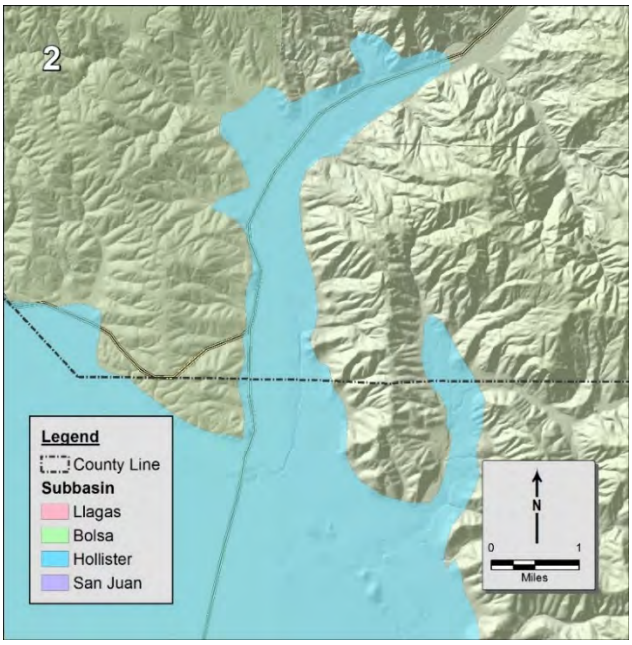
1. Llagas-Bolsa and Llagas-Hollister Boundary along the Pajaro River/County Line



The boundary between the Llagas-Bolsa and Llagas-Hollister subbasins does not coincide neatly with the San Benito-Santa Clara county line, but in some areas is aligned with the Pajaro River. This would cause governance issues for both San Benito County Water District and Santa Clara Valley Water District (SCVWD). Recognizing these issues in a number of California basins with river/county boundaries, DWR has begun to realign some boundaries to better represent Bulletin 118 intent and to specify the county line as the boundary. For San Benito and Santa Clara counties, the respective subbasin areas are shown on Inset Map 1 along with the areas affected by DWR revisions. These edits apparently reassign these areas between the Llagas and the Bolsa or Hollister subbasins, so all areas would remain subject to SGMA, and be under the appropriate jurisdiction. This represents an effective solution.

2. Santa Clara-San Benito County Line and Hollister Subbasin

Portions of the Hollister subbasin extend into Santa Clara County as shown on Inset Map 2. The subbasin is predominantly within San Benito County and the jurisdiction of the District, and is actively managed by the District. The portions in Santa Clara County are hydrogeologically continuous and connected with the remainder of the subbasin. These are alluvial areas (e.g., Pacheco Creek Valley and Las Viboras Valley) and productive groundwater areas that support irrigation and domestic production wells or are apparently capable of such production. They are upstream of the San Benito County portion of the Hollister Subbasin with potential for downstream impacts. Accordingly, these areas are part of the Hollister Subbasin and should be part of subbasin management.

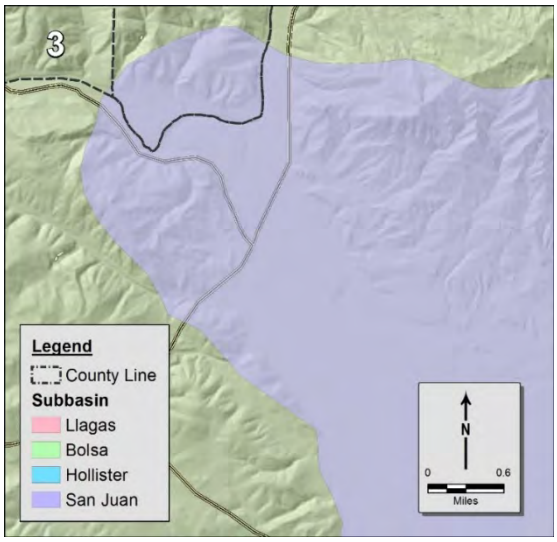


These areas are within SCVWD jurisdiction—for which SCVWD is the exclusive GSA—but apparently are not actively managed by SCVWD. In addition, SGMA provides SCVWD (and other exclusive GSAs) the ability to "opt out" of being a GSA, in which case, the County of Santa Clara is the default GSA. Nonetheless, the entire basin—including these areas—is required to be addressed in a GSP. Given the location of these areas within SCVWD and given their upgradient status relative to the remainder of the Hollister subbasin managed by SBCWD, then collaborative management between the two districts would support compliance and avoid probation (should a GSP not be prepared). The two districts should collaboratively manage the areas through an agreement such as a Memorandum of Agreement.

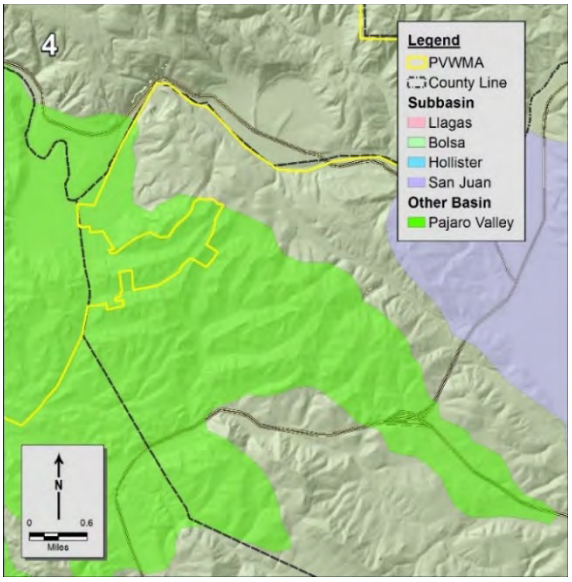
3. Portion of San Juan Subbasin in Santa Clara County

As shown Inset Map 3, a small portion of the San Juan Subbasin has been mapped as extending across the Pajaro River into Santa Clara County. Bulletin 118 text indicates that the Pajaro River (which is coincident with the county line here) is the northern boundary of the San Juan subbasin, but the small area may contain an aquifer that is hydrogeologically continuous with the remainder of the San Juan Subbasin and sufficiently warranted to be part of the subbasin. At this time, the District is sharing available well information with SCVWD to assess the small area.

This small area may be appropriate for DWR to realign the mapped boundaries to better represent Bulletin 118 intent and to specify the county line as the boundary. The county line would be preferred because it does not shift as does a river. If the boundary is not edited, SCVWD is the GSA (although it may opt out), but the area still would need to be included in a GSP. If not addressed in a GSP, coverage of the San Juan Subbasin by a GSP would be incomplete, and the GSP for San Juan Subbasin would be deemed inadequate, risking probation. Unless resolved by DWR realignment, SCVWD and/or SBCWD could request an internal jurisdictional boundary adjustment for this portion of the basin boundary to coincide with the county line.



4. Portion of Pajaro Valley Basin in San Benito County but not PVWMA



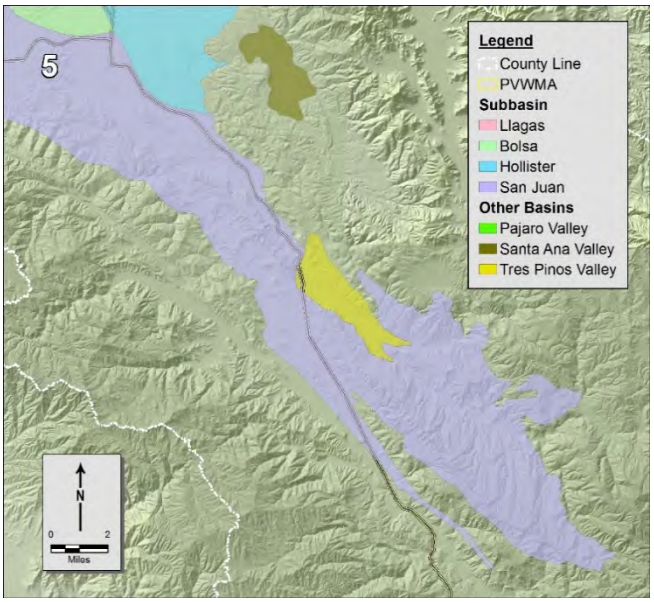
In Bulletin 118, the Pajaro Valley Basin is described as bounded on the east by the San Andreas Fault and pre-Quaternary formations. This indicates that the basin extends into San Benito County; DWR boundaries are depicted on Inset Map 4. Pajaro Valley Water Management Agency (PVWMA) was established to manage that basin and the PVWMA website indicates that PVWMA boundaries were drawn as closely as possible to match the basin boundaries described in Bulletin 118-80. Inset Map 4 indicates that PVWMA jurisdiction does not completely encompass the Pajaro Valley Basin, resulting in potentially unmanaged areas in San Benito County and District jurisdiction.

General knowledge of local groundwater conditions in eastern Pajaro Valley Basin suggests that the potentially unmanaged area may not warrant inclusion in any groundwater basin. To avoid a potential unmanaged area, PVWMA and SBCWD should collaborate to evaluate the status of this area. A boundary modification request may be needed, noting that the Pajaro Valley Basin (designated as critically overdrafted) should have a GSP by the early deadline of 2020.

If the portion of the Pajaro Valley Basin into San Benito County is confirmed as part of the groundwater basin, then a GSA is needed to provide full coverage; candidates would be PVWMA (preferred as the agency established to manage the basin), the District, or San Benito County (as the default). It is recommended that the District continue discussions with PVWMA to address this area.

5. Basin boundaries internal to SB County: San Juan, Tres Pinos, Santa Ana, and others

Bulletin 118 boundaries are different from the subbasin boundaries that were defined for the District in 1996 and used thereafter in Annual Reports (compare Figures 1 and 2). Inset Map 5 shows the southern portion of the San Juan Subbasin (as defined by Bulletin 118), which extends far into areas with currently minimal development, data, and management. Nonetheless, these southern areas are included by DWR in the medium-priority San Juan subbasin and are subject to SGMA. Other basins in southern San Benito County are very low priority; for example, Inset Map 5 shows the Santa Ana Valley and Tres Pinos Valley basins, which also currently have minimal development and are not subject to SGMA. Accordingly, the DWR basin definitions present management issues with regard to monitoring, management, and reporting in a cost-effective and equable manner.



One option would involve a request to subdivide the San Juan Subbasin into northern and southern portions. The northern portion would remain medium priority and the southern part would likely by very low priority. This would require a series of District actions, including a process of notification to DWR and the public, provision of supporting information, and submittal of technical information. Such a request would face a “high bar” of demonstrating that the subdivision is supportive of sustainable management both for the new subbasin and adjacent basins. This is technically possible, but would require an investment of time and money without guarantee of success.

Alternatively, the default DWR basin boundaries can be accepted (at least for the near term), and modifications can be made internally and gradually to groundwater monitoring and management practices. This latter option recognizes that the DWR boundaries have been used by the District, for example, for the Salt and Nutrient Management Plan (Todd Groundwater, 2013) and for CASGEM compliance. Internal modification can be made through the Annual Reporting process and would involve redefining the 1996 subbasins as management areas and some adaption of data collection, data analyses, and reporting.

Groundwater Sustainability Agencies

SGMA requires that a Groundwater Sustainability Agency (GSA) be established for all medium and high priority basins by June 30, 2017. One or more GSAs may be formed in a basin, but coverage of the basin must be complete. Any local water or land use agency or combination of local agencies overlying a groundwater basin may elect to be a GSA. Some agencies that have been created by statute to manage groundwater already have been deemed the exclusive agencies to comply with the Act within their boundaries, unless the agency elects to opt out. Both SCVWD and PVWMA are already identified in the legislation as exclusive agencies. As a default, counties will be assumed to be the GSAs for unmanaged basins or unmanaged portions of basins.

Given its historical groundwater management leadership in San Benito County and its County-wide jurisdiction, it is recommended that the District elect to be a GSA for the medium-priority subbasins within its jurisdiction. (It may also consider electing to be GSA for other basins regardless of priority ranking).

In brief, the process of forming a GSA includes:

- developing a detailed description of the proposed boundaries of the basin or portion of the basin to be managed by the GSA
- preparing new bylaws, ordinances or authorities (including review of existing authorities/limitations in the District's founding act to identify potential contradictions)
- developing a list of stakeholders and preparing an explanation of how their interests will be considered in the GSP
- holding a properly-noticed hearing and passing a resolution
- providing a notice to DWR within 30 days (including documentation of the above items).

After 90 days, if no other agency elects to be GSA, then the District would become the exclusive GSA for the basin or portion of the basin.

Once established, a GSA will have authorities and management tools for compliance with SGMA and achievement of sustainability. Recognizing that GSAs will be involved in various management activities, SGMA has provided the ability to assess various fees to establish and implement the GSP (Cristy, 2015). Costs of planning and monitoring (operations) may be paid from fees collected from property owners, in particular, those who extract groundwater. Project capital costs may also be funded from property fees.

Another source of funding for project costs will be State loans and grants. For example, the Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1) was approved by the voters in November 2014; the Sustainable Groundwater Planning (SGWP) Grant Program provides funds to eligible applicants (including public agencies) for projects that develop and implement sustainable groundwater planning and projects. Available funding amounts to a total of $100,000,000. The first round of funding, directed to stressed counties, is underway.

DWR has developed an extensive and interactive website to assist with SGMA. Selected links that provide useful information and tools are provided in the box below.

DWR INTERNET RESOURCES

- Announcements
  http://www.water.ca.gov/groundwater/sgm/index.cfm
- Basin Prioritization
  http://www.water.ca.gov/groundwater/sgm/SGM_BasinPriority.cfm
- Basin Boundary Modifications
  http://www.water.ca.gov/groundwater/sgm/basin_boundaries.cfm
- Groundwater Sustainability Agencies
  http://www.water.ca.gov/groundwater/sgm/gsa.cfm
- Planning Grant Program
  http://www.water.ca.gov/irwm/grants/sgwp/index.cfm

4 WATER SOURCES AND USE

Water Supply Sources

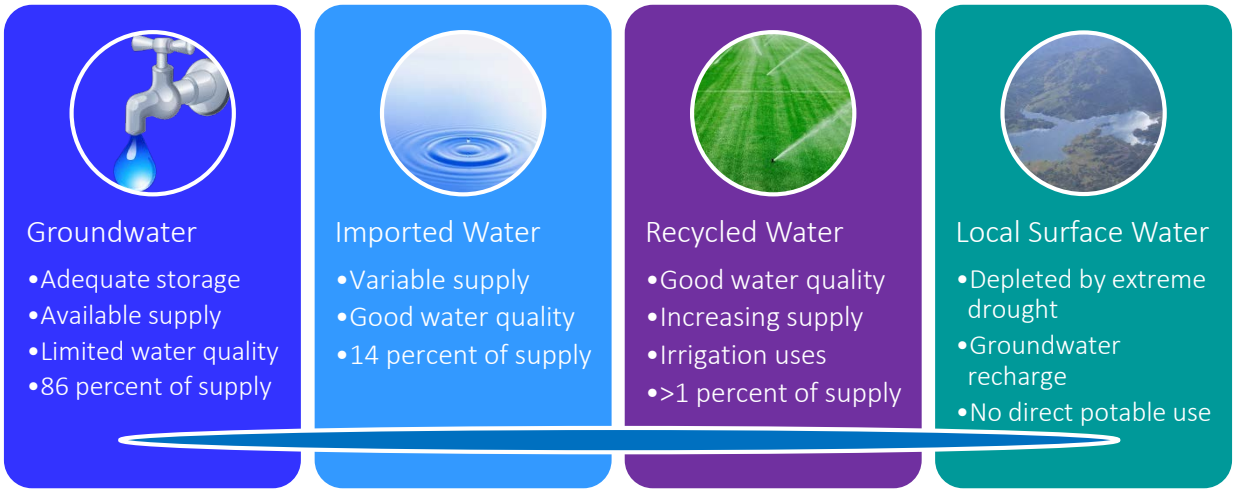
San Benito County has four major sources of water supply for municipal, rural, and agricultural land uses. These are summarized below; for more data and graphs see Appendix E.

- **Local Groundwater.** Groundwater is withdrawn from the basin by private irrigation and domestic wells and by public water supply retailers. The District does not directly produce or sell groundwater, but is active in groundwater management throughout San Benito County. This report focuses on the southern part of the Gilroy-Hollister groundwater basin (DWR Basin 3-3) and reports data on eight District defined subbasins.

- **Imported Water.** The District also purchases Central Valley Project (CVP) water from the U. S. Bureau of Reclamation (USBR). The District has a 40-year contract (extending to 2027) for a maximum of 8,250 AFY of M&I water and 35,550 AFY of agricultural water.

- **Recycled Water.** Recycled water is in the initial phases of development as a source of irrigation water and is presently used to irrigate Brigantino Park. Recycled water use was only 101 AF in WY 2015 but is expected to increase in the near future. This source is generally reliable during droughts.

- **Local Surface Water.** Surface water is not used directly for potable or irrigation use in the basin, but creek percolation is a significant source of groundwater recharge. The District owns and operates two reservoirs: Hernandez and Paicines (see Appendix C, Figure C-1). There were no storage releases from either reservoir during 2015, the second year in a row.



Available Imported Water

The District distributes CVP water to agricultural and M&I customers in Zone 6. In USBR contract year 2015 (March 2015 - February 2016), water allocations were reduced by USBR to 0 percent of the contract for agriculture and 25 percent of the contract for M&I. These are the lowest allocations since imported water has been available. Table 2 shows the contract entitlements and recent allocations (SLDMWA 2015). Note that USBR contract years are March through February, so water year 2015 overlapped two contract years.

The District renegotiated their shortage policy with USBR in 2015. Now the District will receive the allocated percent of their full M&I contract (8,250 AFY), even in dry years. In past years if the allocation was decreased due to water shortage (an allocation of 75 percent or less), the District received the allocated percent of their historic use. In 2014 for example, the historic use was 5,556 AFY. In Water Year 2015, the District is allocated 25 percent of their full contract (8,250 AFY). This could increase the M&I amount allocated in shortage years.

Table 2. CVP Entitlements and Allocations, USBR Contract Years 2014-2015

March 2014 - February 2015

	Shortage Year Adjustments	% Allocation	Allocation Volume (af)
Agriculture	38,244	0%	0
M&I	8,250	50%	4,125
TOTAL	**43,800**		**4,125**

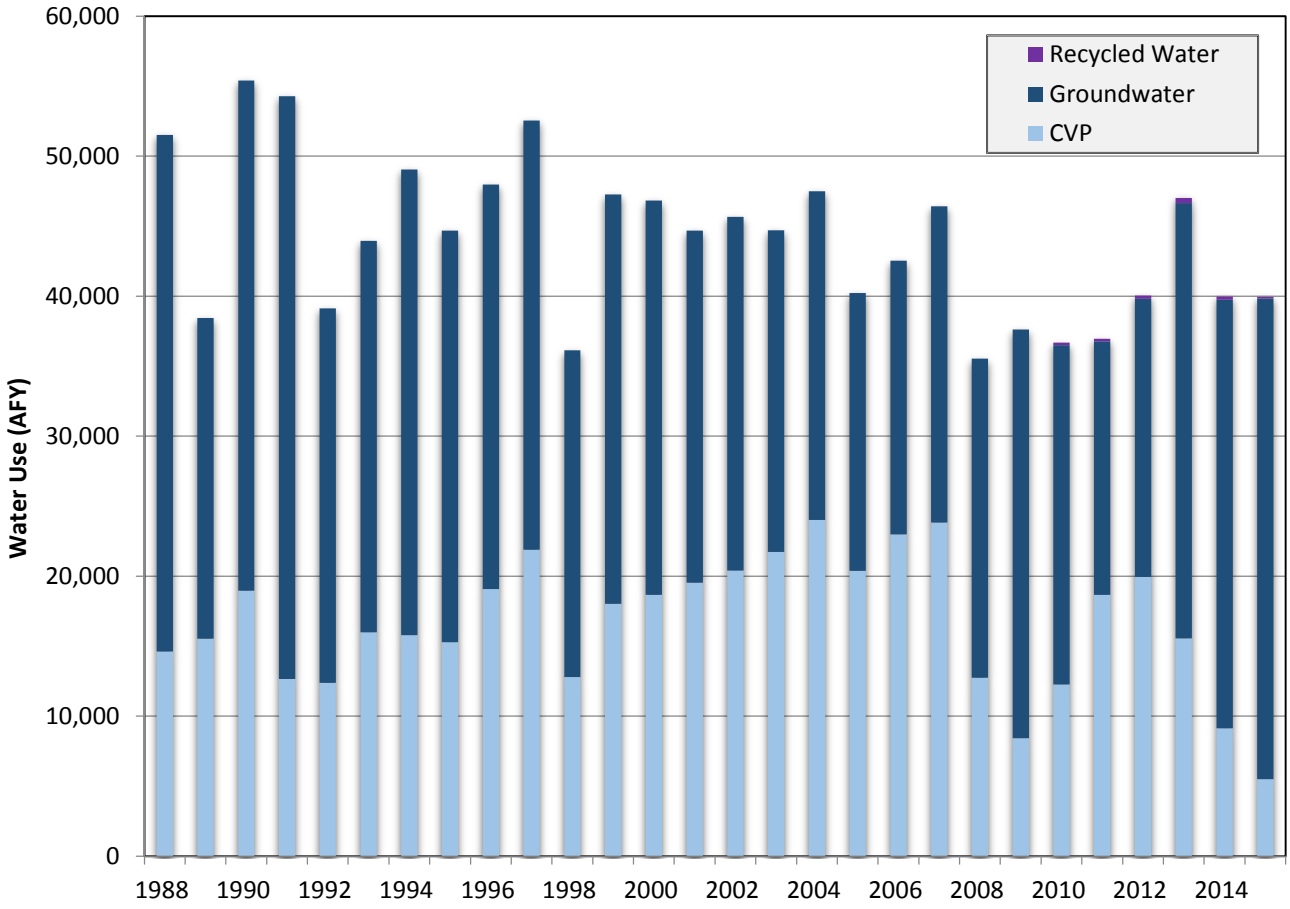
March 2015 - February 2016

	Shortage Year Adjustments	% Allocation	Allocation Volume (af)
Agriculture	38,244	0%	0
M&I	8,250	25%	2,063
TOTAL	**43,800**		**2,063**

Water Use

In 2015, total water use was very similar to 2014 water use, almost 40,000 AF. **Figure 6** shows the total water use from 1988 through 2015. As shown in the graph, groundwater use increased over last year, from 77 percent in 2014 to 86 percent of supply in 2015. Figure 4 also shows that water demand has declined over the last eight years (with the exception of 2013). Rainfall has been below normal for most years since 2008, and water conservation and drought awareness have had an effect on water use. While water conservation measures could be nearing saturation in the District, the positive effect should be noted during a particularly severe drought.

Figure 6. Total Water Use by Source 1988-2015 (AFY)



Distribution of Demand by Source and Use

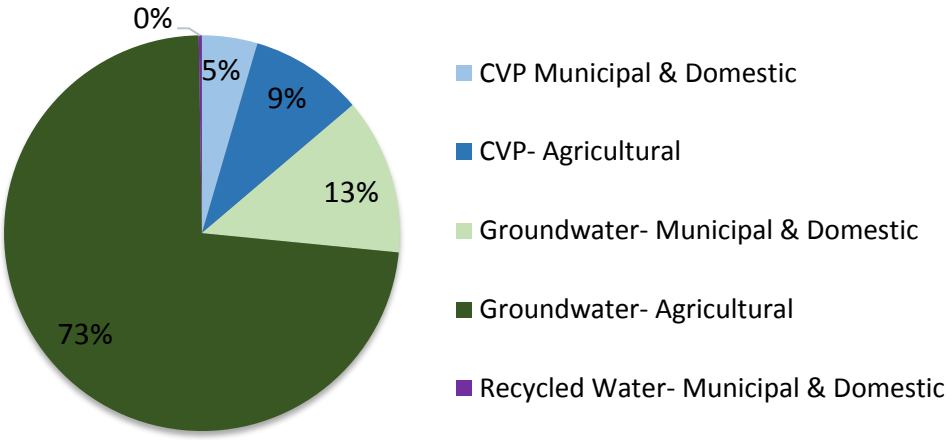
This year saw a continued decline in the availability of CVP water. The volume of CVP imported into the basin was the lowest since 1988, when imports began. Because of this shortage, groundwater pumping increased to meet demand. Table 3 shows the total water deliveries from CVP, groundwater, and recycled water sources.

Table 3. Total Water Deliveries for Water Year 2015 (AF)

	CVP		Groundwater		Recycled Water		Total	
	2014	2015	2014	2015	2014	2015	2014	2015
Agriculture	7,545	3,697	21,189	29,229	-	-	28,734	32,926
M&I	1,599	1,810	9,403	5,099	262	101	11,263	7,010
TOTAL	**9,144**	**5,507**	**30,592**	**34,327**	**262**	**101**	**39,997**	**39,935**

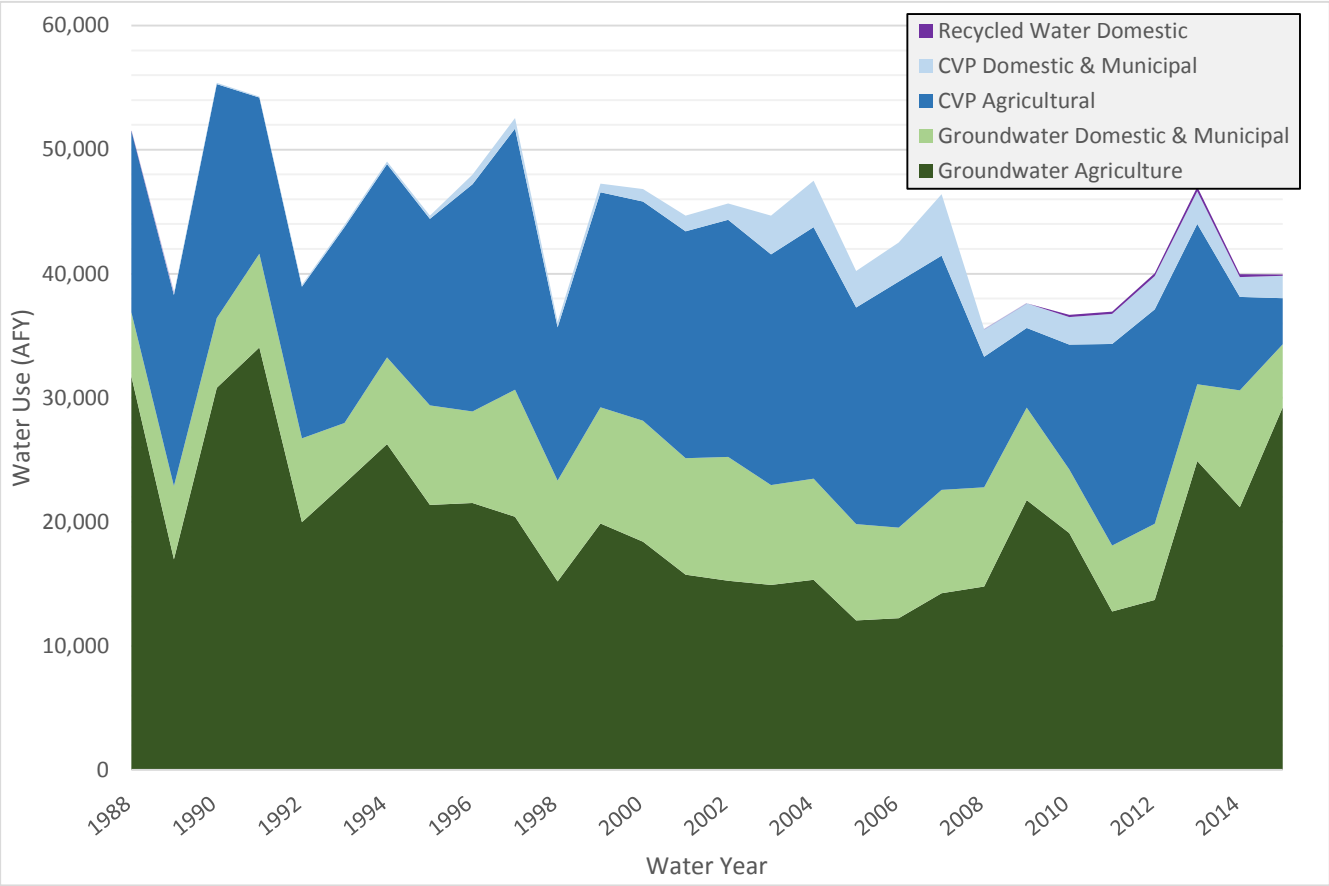
In 2015, groundwater represented 86 percent of total supply, mostly due to increases in groundwater pumping for agricultural use. Groundwater for M&I use decreased due to water conservation from the cities in the region. **Figure 7** shows the distribution of total supply by water supply source and user type. Because the largest volume of groundwater serves agricultural users, the increased groundwater use causes widely distributed declines in groundwater (as opposed to a focused drawdown in a local area). This is discussed in detail in Section 5.

Figure 7. Water demand by source and use, 2015



For the third year in a row, agricultural water users offset the low CVP allocation with higher groundwater pumping. **Figure 8** shows the shows historical total water use by water source and water use in the Zone 6 area.

Figure 8. Water demand by source and use 1988-2015



Agricultural use has represented most of water use, ranging from 71 to 90 percent of total demand. In 2015, this sector represented 83 percent of demand. Groundwater for agriculture use is the highest water use/water source combination in most years, averaging 45 percent of total demand from 1988 through 2015. However over the past 20 years CVP water for agriculture use exceeded groundwater agricultural use half of the time. In 2015, groundwater use for agriculture exceeded the use of CVP water by a factor of almost eight, the largest contribution since imports began in 1988.

Municipal and domestic use decreased in water year 2015, in a large part due to the mandatory water conservation. Sunnyslope and Hollister have decreased municipal water demand by 36 and 24 percent, respectively since 2013 in response to mandated conservation. In the past, the use of CVP water for direct M&I use was usually limited by the available treatment capacity of the Lessalt treatment plant. This year the plant was expanded but total CVP water for M&I was limited by CVP allocation and a short period of downtime required to upgrade the plant. In 2015, Lessalt served 1,364 AF, higher than 2014, but below the ten year average.

Table 4. Zone 6 Water Use in Water Year 2015 (AF)

Subbasin	CVP Water		Groundwater		Recycled Water
	Agriculture	Domestic & Municipal	Agriculture	Domestic & Municipal	Domestic & Municipal
Bolsa South East	20	0	2,396	5	0
Hollister East	2,130	1,438	6,334	896	0
Hollister West	115	33	2,636	2,094	101
Pacheco	534	21	4,124	155	0
San Juan	843	131	12,280	459	0
Tres Pinos	54	187	1,459	1,489	0
TOTAL	**3,697**	**1,810**	**29,229**	**5,099**	**101**

Figure 9. Water Use by Subbasin 2015.

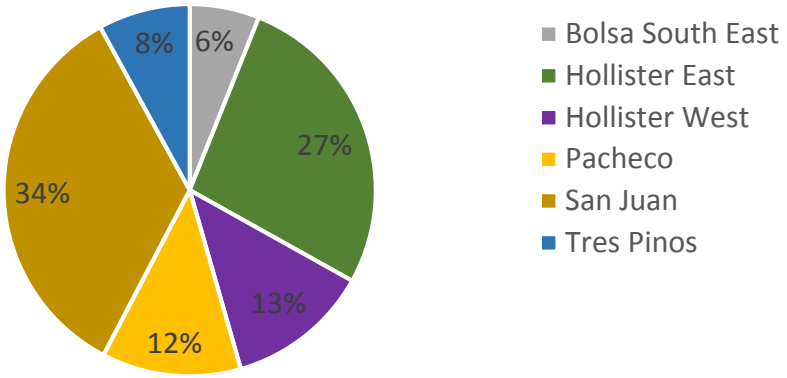


Table 4 shows Zone 6 water use by subbasin, user category, and water type for 2015. Zone 6 includes the Bolsa Southeast, Pacheco, Hollister East, Hollister West, Tres Pinos, and San Juan subbasins. **Figure 9** shows the relative use by subbasin. San Juan represents the largest portion of water use, 34 percent of the demand, most of which is for agriculture. Continued reliance on groundwater in areas that have had significant groundwater declines during the current drought is a potential problem (especially in San Juan and Hollister West). Managed recovery may be necessary to restore the groundwater reserves in these areas.

5 GROUNDWATER LEVELS

In October 2015, groundwater levels continued to decline in areas of the basin that rely heavily on groundwater, specifically in the Bolsa, San Juan, Hollister West, Bolsa SE, and Tres Pinos subbasins. These subbasins have now sustained three successive years of prolonged drought and limited CVP imports. Groundwater elevation declines during drought do not constitute overdraft; nevertheless, the continued reduced supplies of imported water in tandem with increased groundwater demands are a warning of potential groundwater overdraft.

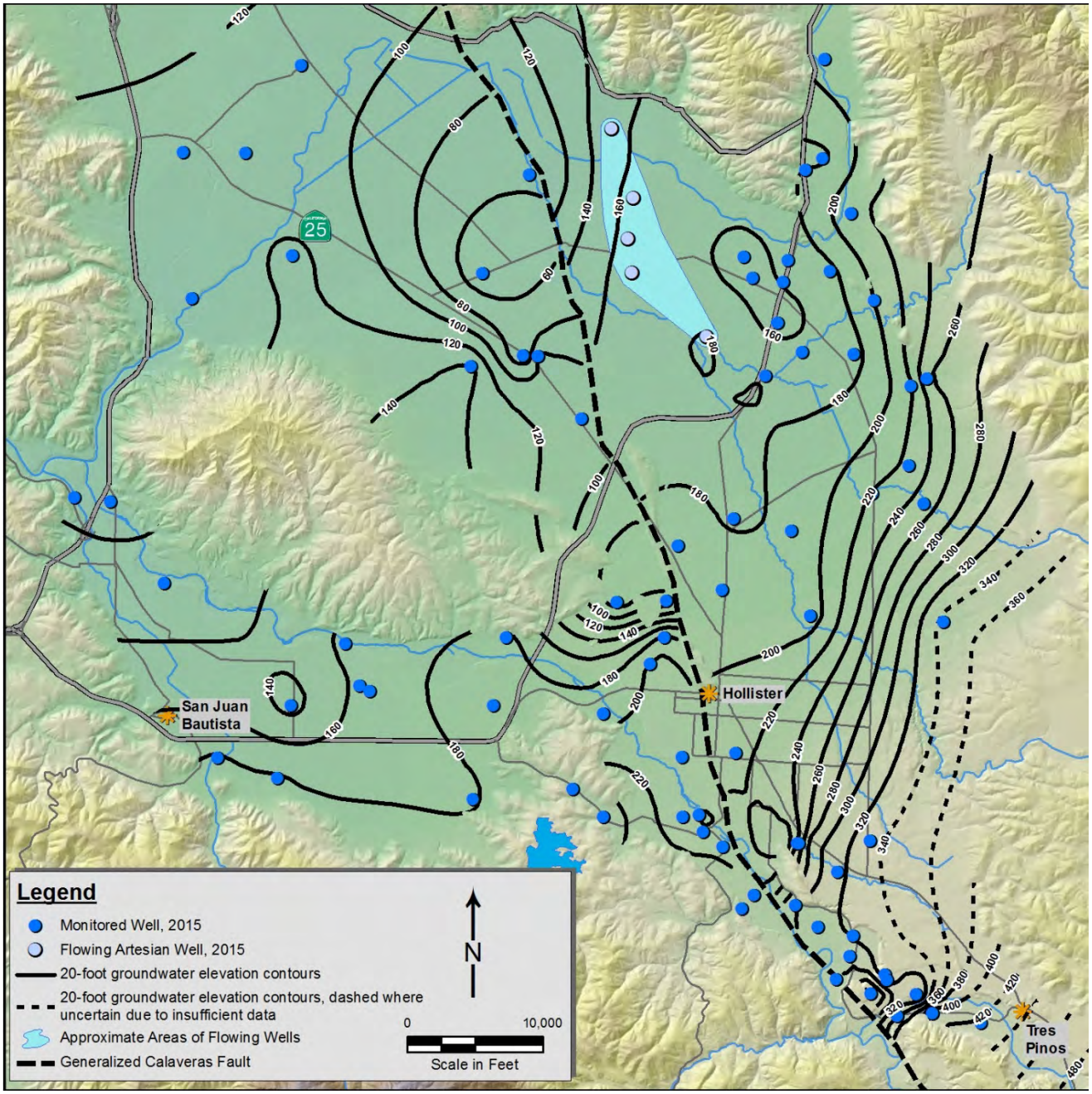
As indicated in the water use section, growers and other water users are relying on groundwater to compensate for reduced CVP allocations. It appears that sufficient storage remains in the basin to accommodate additional dry conditions with limited imported water availability. However, if drought conditions persist, avoidance of significant impacts will require delivery of alternative supplies to sensitive areas or more rigorous water demand management.

The District should continue to manage groundwater resources for substantial and rapid recovery in wet years, recognizing that most years are average to dry and wet years are less frequent. Fortunately, lower groundwater elevations represent increased potential for capturing water from runoff and add it to groundwater stored in the basin. This presents opportunities to maximize recharge from precipitation events, streamflow, and reservoir releases when water is available. However, recharge from precipitation and streamflow in and of itself may not provide sufficient recharge for recovery in the subbasins that have been most affected by the last several years of dry conditions and increased groundwater use. Therefore, management actions that have direct benefit to San Juan and the other affected subbasins should be considered. Additional information on groundwater elevations (including profiles of basin cross sections and depth to water contours) are included in Appendix C.

Groundwater Elevations

Groundwater elevation data were examined from 86 wells in the District's quarterly groundwater elevation monitoring program. October groundwater elevation data are used for preparing groundwater elevation contour maps. Groundwater elevations in the fall, including those shown in **Figure 10**, are assumed to represent the lowest levels for the water year. The groundwater elevation contouring methods incorporate the effects of the Calaveras Fault on water levels by splitting the area into eastern and western portions and then generating contours for each. The resulting contours are then evaluated for consistency and reasonableness and any necessary refinements are made. The contours indicate a general flow from southeast to northwest. Additional groundwater level data are presented in Appendix C, including maps, summary tables, and water level data.

Figure 10. Groundwater Elevations, October 2015



The relative changes in groundwater elevations from October 2014 to October 2015 are shown on **Figure 11.** The map was prepared by calculating and contouring the differences between mapped groundwater elevations for the two periods. The accuracy of this map was checked by examining water level changes in individual wells that were monitored in the fall quarter (October) of both years. **Figure 12** shows the cumulative drawdown over the current drought (2011-2015. White the reduced water levels are uneven, average levels in most subbasins have decreased; San Juan subbasin water levels have decreased 28 feet since 2011.

Figure 11. Change in Groundwater Elevations 2014-2015

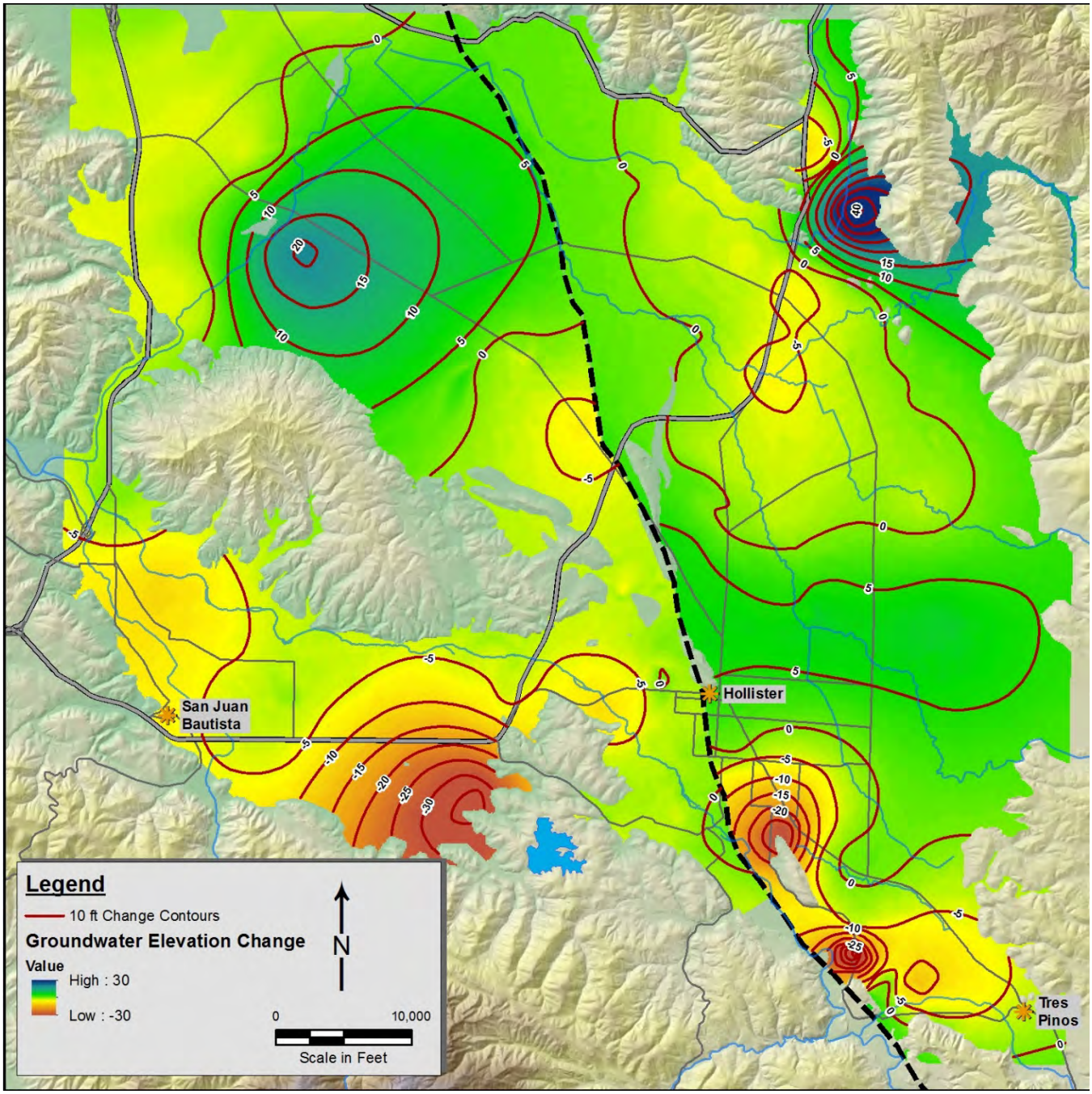
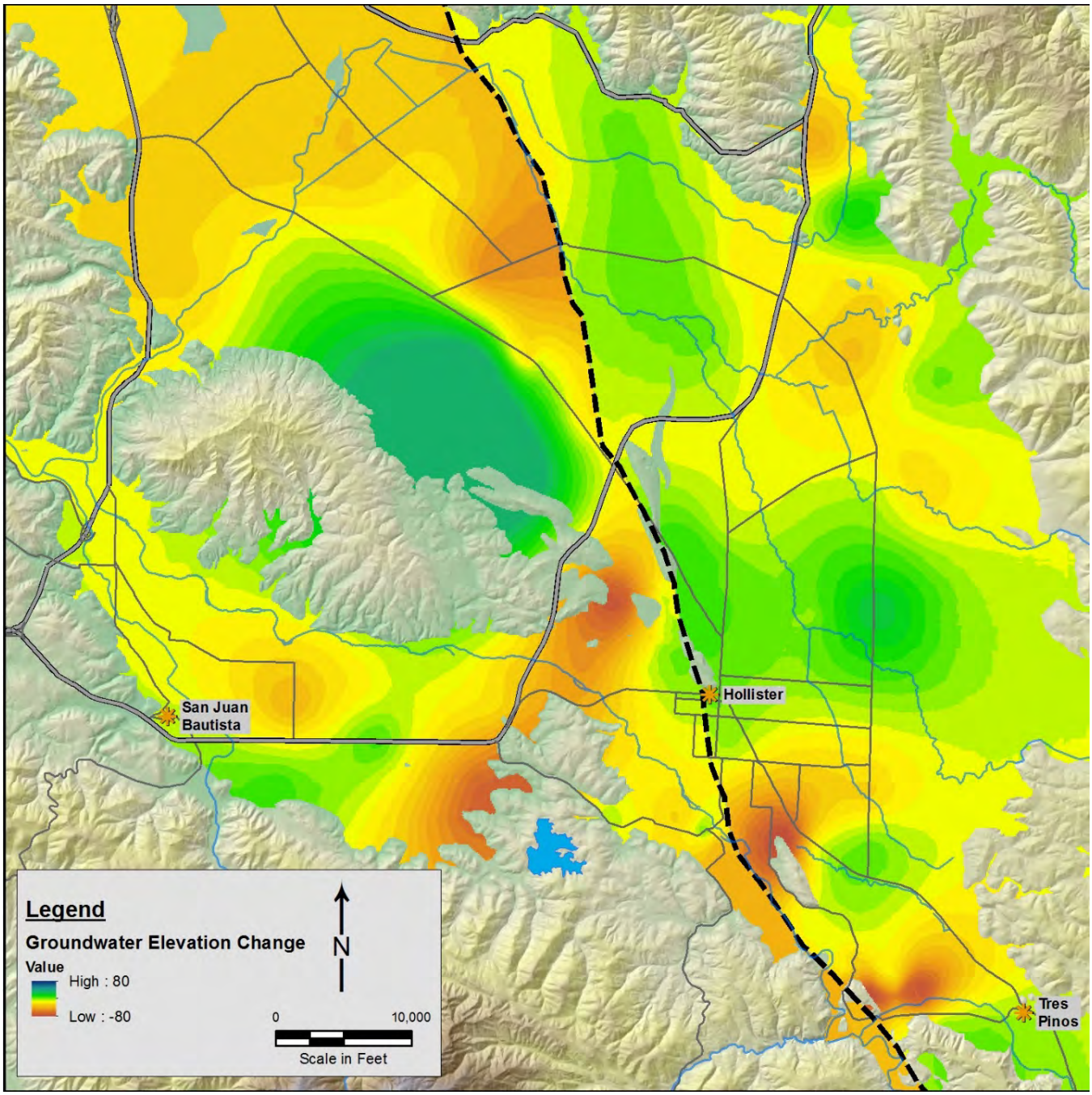


Figure 12. Cumulative Change in Groundwater Elevations 2011-2015

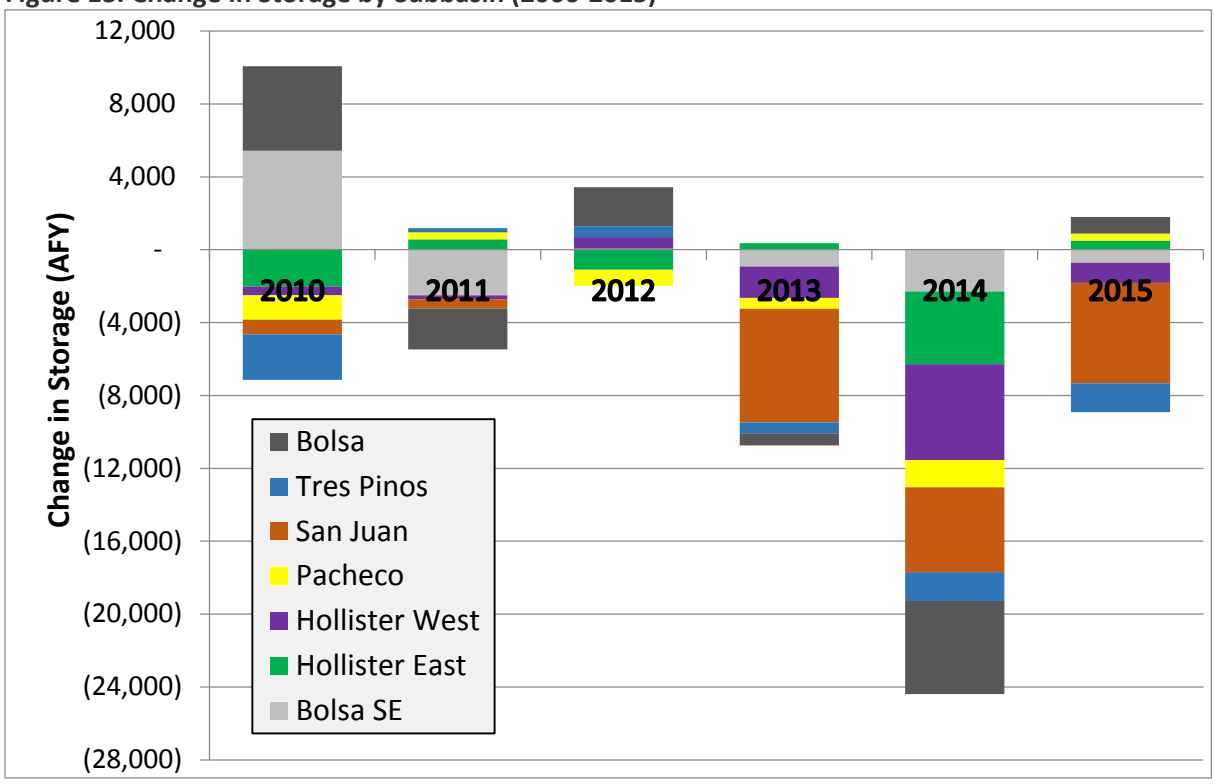


Change in Storage

Groundwater elevation changes from October 2014 to October 2015 were used to determine the change in storage, which is the net volume of water added to or removed from the basin over the water year. The change in storage was calculated using the change in groundwater elevations (feet) and multiplying by the total area (acres) to determine the total bulk volume of change. This bulk volume of change is then multiplied by the average storativity of the subbasin to represent the amount of water that a given volume of aquifer will produce. The storativity values for each subbasin were derived from a numerical model of the basin developed by Yates and Zhang (2001).

The total change in groundwater storage for Zone 6 was a decrease of 8,040 AF, while the total change for the basin, including the Bolsa subbasin, was a decrease of 7,125 AF. These large decreases in storage, while expected, are significant. This marks the third year of significant decreased storage in Hollister West and San Juan. Since the current drought began in 2011, average subbasin water levels have decreased by 24 and 28 feet, in Hollister West and San Juan, respectively. **Figure 13** illustrates the change in storage by subbasin for the past six years.

Figure 13. Change in Storage by Subbasin (2006-2015)



Hydrographs

Long term changes in groundwater elevations in the basin are illustrated in the composite hydrographs. These composite hydrographs are generated by averaging elevations from key wells from each subbasin for each monitoring event. The key well locations are shown on **Figure 14.** It should be noted that these subbasin hydrographs represent average conditions in each subbasin and illustrate long-term trends, but do not show localized variations in groundwater elevations. Overall, groundwater elevations do not indicate overdraft conditions as of 2015.

Water levels in most subbasins have shown a decrease over the multiple year drought consistent with increased pumping and decreased storage. **Figures 14 through 18** shows the composite hydrographs along with drought conditions (shading) and key changes to the basin management. Droughts are defined as periods with annual precipitation significantly below (less than two thirds of the long term average for a multiple year drought and less than 50 percent of the long term average for a single year drought.

Review of the hydrographs shows that long term trends of the subbasin are similar to each other and reflect drought conditions and the management activities pursued by the District.

The hydrographs begin in 1976, just before the dry year of 1977. At that time the basin relied solely on groundwater and water levels were at or near their historical lows. In 1987, the District began receiving water imported from CVP. In all subbasins, including the Bolsa that does not directly receive CVP water, water levels subsequently began to rise. A multiple year drought from 1988 through 1992 slowed the increase in water levels. In some subbasins, there was a marked decline in water levels due to reduced imported water and reduced recharge from surface water. From 1994-2004, managed recharge of CVP water along water ways (e.g., San Benito River) exceeded 1,000 AFY and the result was significant recovery in most subbasins. With water levels rising and recovery complete, recharge was reduced to low maintenance levels. Finally, in response to the latest multiple year drought (2012-2015) water levels have again declined. Given the history of the basin, recovery can be accelerated with targeted management actions in the areas with the most need, given availability of replenishment water (for in-lieu or direct recharge) and, where direct recharge is practiced, accessibility to recharge sites.

Figure 14. Locations of Key Wells Used in Hydrographs

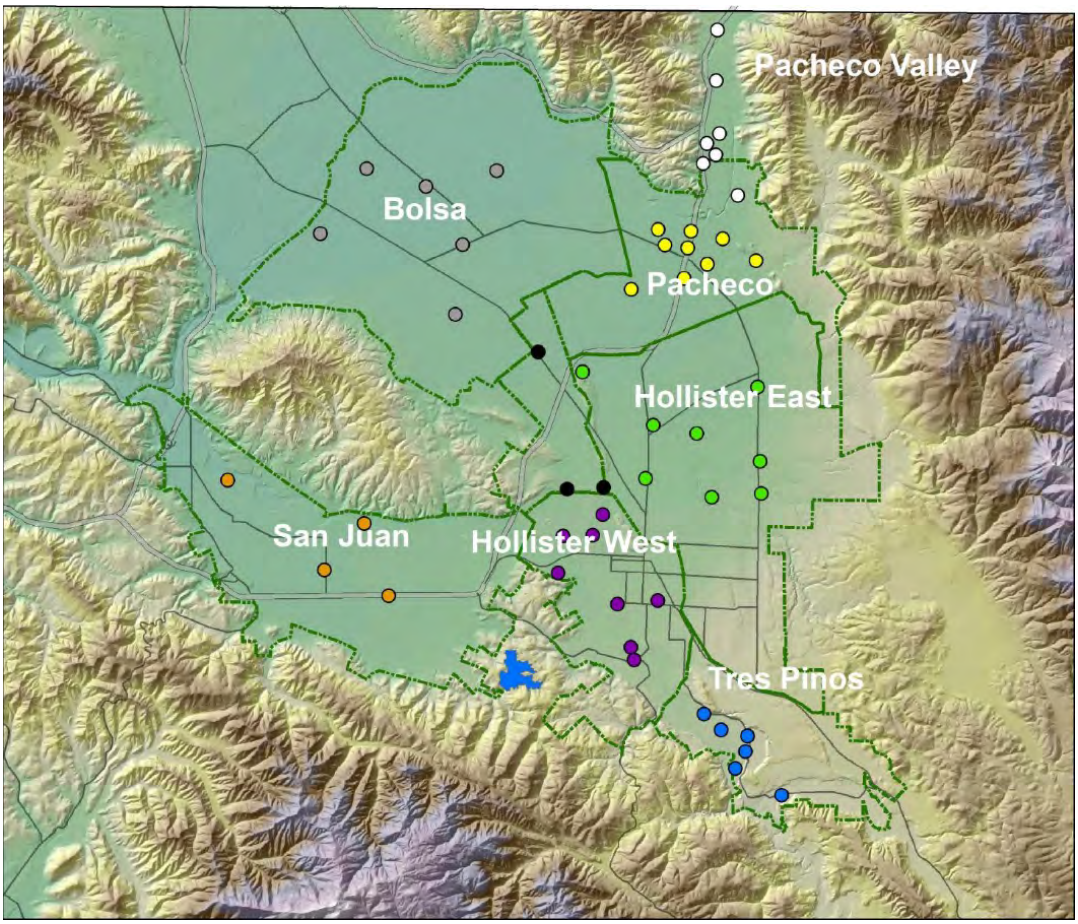


Figure 15. Composite Hydrographs (Pacheco Creek and Pacheco)

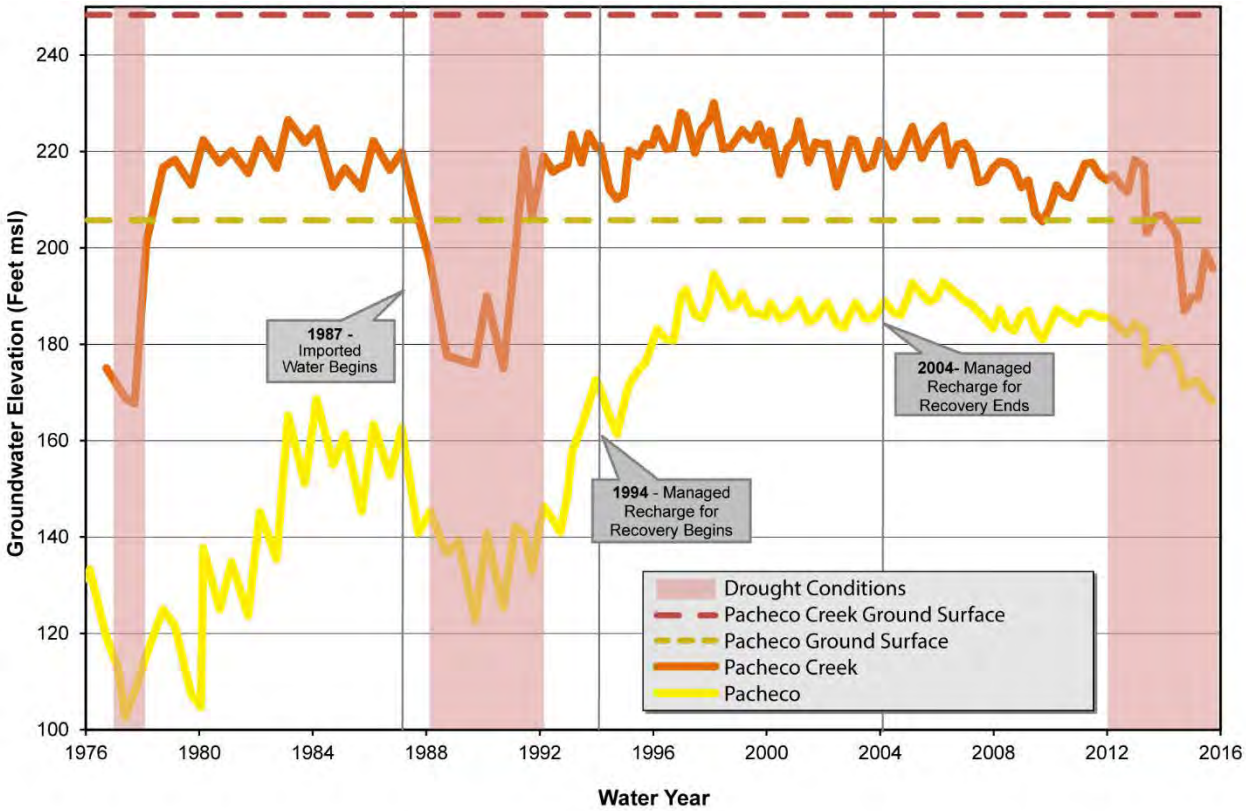


Figure 16. Composite Hydrographs (Bolsa and Bolsa SE)

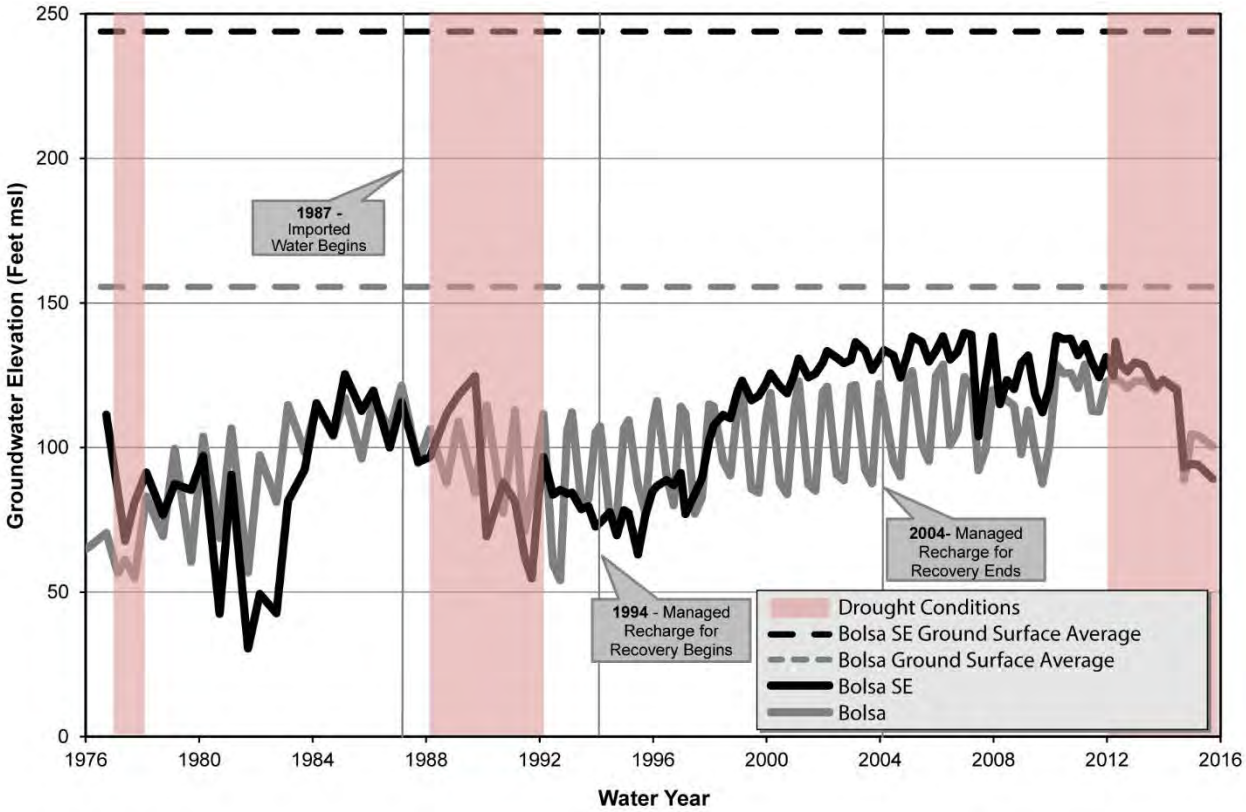


Figure 17. Composite Hydrographs (Hollister East and San Juan)

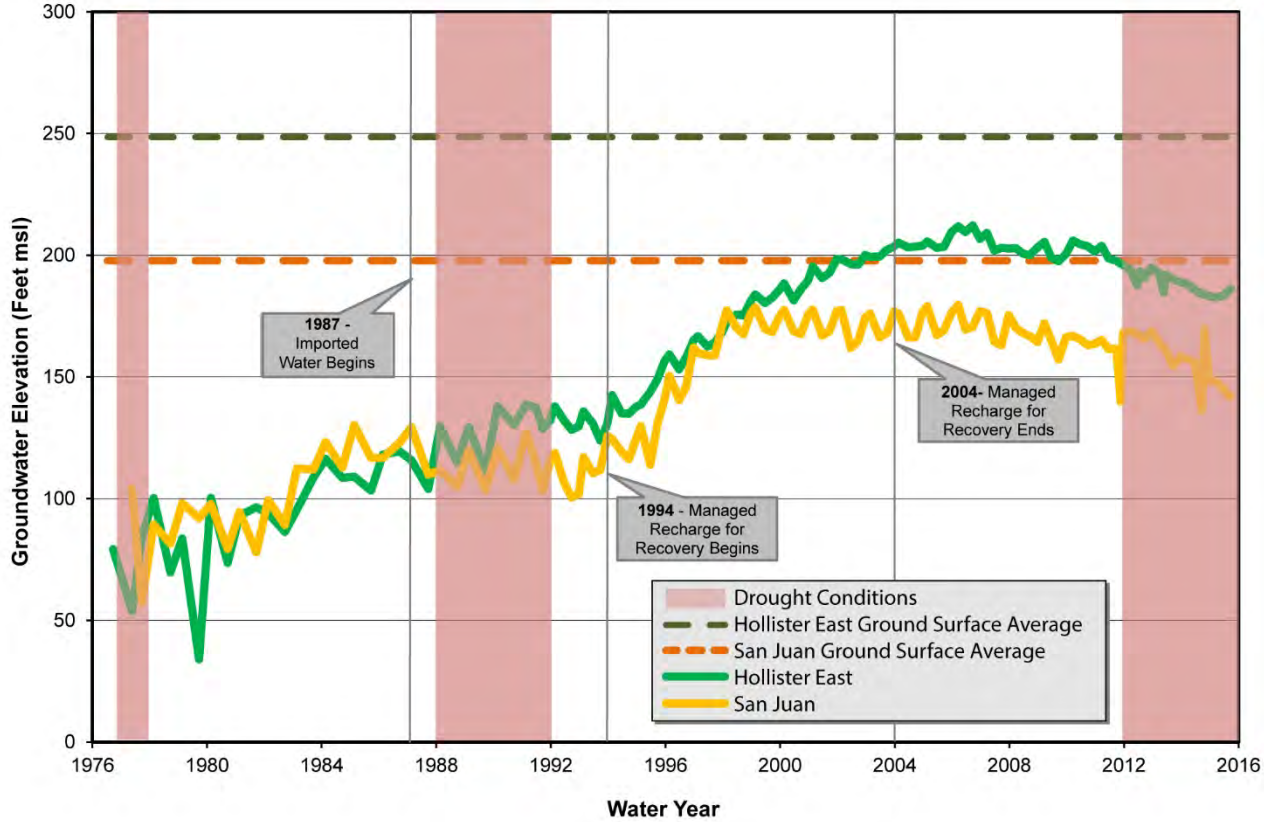
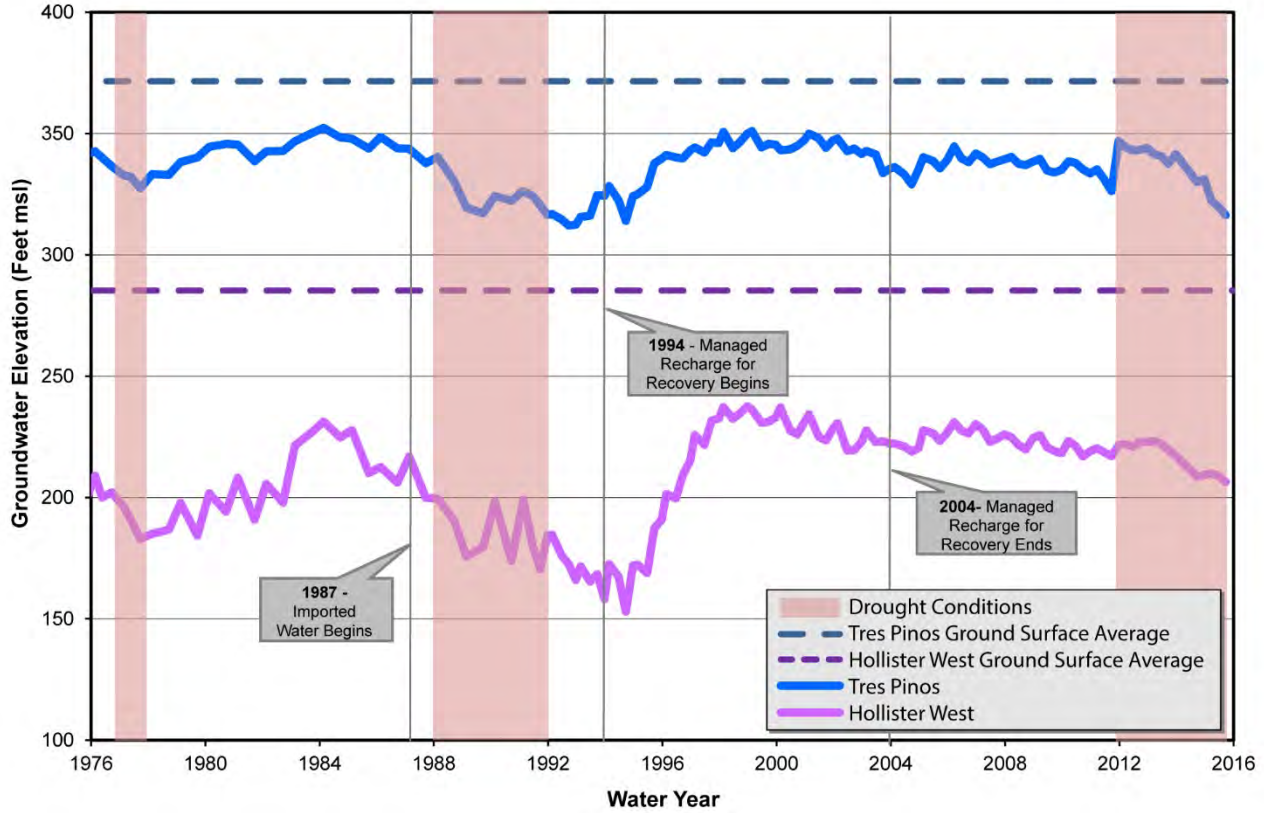


Figure 18. Composite Hydrographs (Tres Pinos and Hollister West)



6 FINANCIAL INFORMATION

The District derives its operating revenue from charges levied on landowners and water users. Non-operating revenue is derived from property taxes, interest, standby and availability charges, and grants. Zone 6 charges relating to the importation and distribution of CVP water are the focus of this section.

Table 5 (on the following page) summarizes District charges for Zone 6 water users. These include a standby and availability charge, groundwater charge, and charges for CVP water including water service charges and power charges. The standby and availability charge is a uniform per-acre charge assessed on all parcels with access to CVP water (an active or idle turnout from the distribution system). The groundwater charge reflects costs associated with groundwater monitoring and management, including the cost of purchasing CVP water and power charges associated with percolation. The per-acre-foot charge is determined by dividing these costs by the volume of groundwater usage. Groundwater charges are adjusted annually in March.

CVP rates include the cost of service, restoration fund payment, charges for maintenance of San Luis Delta Mendota Water Authority facilities, and others fees (the breakdown is found in Appendix F).

The District has also calculated the groundwater charge for the next USBR water year (March 2016-February 2017). The detailed calculation is shown in Appendix F and the District recommends $4.95 for agricultural use in Zone 6 and a groundwater charge of $24.95 is recommended for M&I use in Zone 6.

Assuming that the District becomes a GSA and prepares a GSP, compliance with SGMA will entail increased costs for operation and maintenance in areas beyond Zone 6; the District should explore the financial measures to support SGMA compliance equably across the managed subbasins.

Table 5. Charges for Zone 6 Water Users, March 2015 - February 2016

Charge	Unit	Agricultural			Municipal & Industrial
		Non-Full Cost	Full Cost (1a)	Full Cost (1b)	
Standby and Availability	$/acre	$6.00	$6.00	$6.00	$6.00
Groundwater	$/acre-foot	$3.95	$3.95	$3.95	$23.25
CVP (Blue Valve)					
Water charge (3)	$/acre-foot	$179.00	$315.00	$326.00	$247.00
Power charge					
Subsystem 2	$/acre-foot	$ 42.75	$42.75	$42.75	$42.75
Subsystem 6H	$/acre-foot	$ 31.05	$31.05	$31.05	$31.05
Subsystem 9L	$/acre-foot	$ 45.70	$45.70	$45.70	$45.70
Subsystem 9H	$/acre-foot	$ 97.15	$97.15	$97.15	$97.15
All other subsystems	$/acre-foot	$ 23.80	$23.80	$23.80	$23.80

1 Full-cost rates for agricultural users apply to landholders that have exceeded his/her or its non full-cost entitlement. There are two full-cost rates:

a. Section 202(3) - the lower full-cost rate, which applies to qualified recipients leasing in excess of their 960-acre entitlement, limited recipients that received Reclamation irrigation water on or before October 1, 1981, and extended recordable contracts.

b. Section 205(a)(3) - the higher full-cost rate, which applies to prior law recipients leasing in excess of their applicable non full-cost entitlement, and limited recipients that did not receive Reclamation irrigation water on or before October 1, 1981. See Section 202(3) or 205(a)(3) of RRA Rules and Regulations for further non full-cost definitions.

2 For parcels 10 acres or smaller in size the water charge is $29.85 and $20.60 monthly for agriculture and M&I respectively. Monthly charges include annual minimum quantity (Agricultural at 2 acre-feet per year and M&I at 1 acre-foot per year), with water use above the annual minimum charged at applicable Agricultural or Non-Agricultural water rate.

The District has also calculated the groundwater charge for the next USBR water year (March 2016-February 2017). The detailed calculation is shown in Appendix F and the District recommends $4.95 for agricultural use in Zone 6 and a groundwater charge of $24.95 is recommended for M&I use in Zone 6.

7 OUTLOOK

El Niño

The next water year is expected to be an El Niño year, with strong evidence that precipitation will be above normal for Northern California. According to the National Weather Service (NWS), precipitation in water year 2016 is expected to be average for the winter months and above average for the critical spring months. Previous El Niño years include water years 1958, 1966-7, 1973, 1983-84, and 1998. The average Hollister precipitation in these El Niño years was 22 inches, 174 percent of normal. While an El Niño year brings more precipitation, the increased volume and intensity may lead to relatively more runoff and less recharge to the groundwater basins.

Drought Relief?

Increased rainfall this year alone is unlikely to end the drought. The Association of California Water Agencies (ACWA) has prepared an infographic to highlight what is needed to end the drought, which is provided in Appendix G. The main elements to end California's drought are:

- **Snowpack**- this winter's snowpack would need to return to at least average or above — about 39 inches of snow water content on April 1.
- **Temperatures** - Storms must be cold enough to support significant snowpack in the Sierra.
- **Rainfall** - Based on past drought-busting years, precipitation would need to be about 120% of average in key Northern California watersheds.
- **Reservoirs** - Key reservoirs are about a third of their capacity or less. Above-normal rain and runoff in Northern California would be needed for storage levels to recover this winter.
- **Groundwater** – Water level recovery will be a multi-year process that depends on how subbasins are recharged and how much groundwater continues to be pumped.
- **Water for Farm and Communities Restored** – Lifting of emergency conservation measures and a resumption of deliveries similar to prior non-drought periods will be a sign of drought recovery.

CVP Deliveries

The annual allocation of CVP water remains uncertain. In past years, San Luis & Delta Mendota Water Authority (SLDMWA) has forecasted CVP allocation for the next year. As of November 2015 they have not released a projection, due in part to the repayment of water to the State Water Project and uncertainty with short term water availability. Many factors affect the allocation, including environmental considerations in the Delta, seniority of CVP water rights on water ways, reduced snowpack due to climate change, debt to the State Water Project System and other factors. The District must continue to use their existing tools (and continue to develop new management tools) to ensure a reliable water supply in spite of variable CVP allocations.

Groundwater

In 2015, groundwater storage was reduced significantly in parts of the basin due to increased groundwater use. Current groundwater storage is sufficient to accommodate water demand in the short term with negative water budgets, and the capacity for groundwater recovery in subsequent wet years is sufficient to balance moderate increases in groundwater pumping without causing long-term overdraft. However, persistence of drought and reduced CVP supply entail a real risk of overdraft.

8 RECOMMENDATIONS

The water supply outlook for 2016 is mixed. While precipitation is expected to be above average, the state's and the basin's water resources need to be replenished. The District should move forward with its plans and projects to ensure a more sustainable water supply system that includes a portfolio of sources.

Basin Boundary Revisions. It is recommended the District work closely with Santa Clara Valley Water District and Pajaro Valley Water Management Agency to ensure that boundaries are resolved for compliance with SGMA. No modification of the southern basin boundary is recommended at this time; management (including monitoring, reporting, and financing) can be addressed internally by the District. New internal management areas may be defined to allow flexibility in the level of reporting and management based on priority.

Groundwater Sustainability. It is recommended the District assume the responsibilities of a Groundwater Sustainability Agency and prepare a groundwater sustainability plan for the subbasins of the Gilroy-Hollister Basin in San Benito County. The District should cooperate with Santa Clara Valley Water District and Pajaro Valley Water Management Agency on adjustments of subbasin boundaries to support sustainable management. If portions of a basin or subbasin overlap neighboring jurisdictions, the District should start working with the respective agency toward collaborative preparation of a GSP.

Groundwater Use. Without reliable CVP imports, some subbasins like San Juan continue to pump groundwater from storage and groundwater levels continue to decline. Direct management measures should be taken in areas that have critically low groundwater levels and high use, particularly San Juan and Hollister West.

Groundwater Charges. Based on the methodology used since 2006, the groundwater charge for the USBR contract year (March 2016-February 2017) is recommended to be $4.95 for agricultural use in Zone 6 and a groundwater charge of $24.95 is recommended for M&I use in Zone 6.

G**roundwater Production and Replenishment.** District percolation operations helped reverse historical overdraft and then accumulated a substantial water supply reserve. The District currently manages groundwater storage and surface water to minimize excessively high or low water levels on a temporal and geographic basis. In 2015, it is recommended—insofar as possible—that storage in Hernandez Reservoir be replenished as much as possible. Percolation of available local water supplies should be focused on portions of the basin with groundwater level decline, like San Juan and Hollister West. Both of these subbasins are along San Benito River and would benefit from increased reservoir releases.

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A REPORTING REQUIREMENTS AND SPECIAL TOPICS

The San Benito County Water District Act (1953) is codified in California Water Code Appendix 70. Section 70-7.6 authorizes the District Board of Directors to require the District to prepare an annual groundwater report; this report addresses groundwater conditions of the District and its zones of benefit for the water year, which begins October 1 of the preceding calendar year and ends September 30 of the current calendar year. The Board has consistently ordered preparation of Annual Reports, and the reports have included the contents specified Section 70-7.6:

- An estimate of the annual overdraft for the current water year and for the ensuing water year
- Information for the consideration of the Board in its determination of the annual overdraft and accumulated overdraft as of September 30 of the current year
- A report as to the total production of water from the groundwater supplies of the District and its zones as of September 30 of the current year
- Information for the consideration of the Board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the District and its zones
- The amount of water the District is obligated to purchase during the ensuing water year
- A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the District and its zones during the ensuing water year
- A recommendation as to whether or not a groundwater charge should be levied in any zone(s) of the District in the ensuing water year and if so, a rate per acre-foot for all water other than agricultural water for such zone(s)
- Any other information the Board requires.
- The full text of Appendix 70, Section 70-7.6 through 7.8 is enclosed at the end of this appendix.
- Each water year a special topic is identified for further consideration. These topics have included water quality, salt loading, shallow wells, and others. Additional analyses and documentation provided in previous annual reports are summarized in the following table.

Table A-1. Special Topics in Previous Annual Reports

Water Year	Additional Analyses and Reporting
2000	Methodology to calculate water supply benefits of Zone 3 and 6 operations
2001	Preliminary salt balance
2002	Investigation of individual salt loading sources
2003	Documentation of nitrate in supply wells, drains, monitor wells, San Juan Creek
2004	Documentation of depth to groundwater in shallow wells
2005	Tabulation of waste discharger permit conditions and recent water quality monitoring results
2006	Rate study
2007	Water quality update
2008	Water budget update
2009	Water demand and supply
2010	Water quality update
2011	Water budget update
2012	Land use update
2013	Water quality update
2014	Water balance update and Groundwater Sustainability
2015	Groundwater Sustainability – Basin Boundaries and GSAs

Water Code Appendix 70 Excerpts

Section 70-7.6. Groundwater; investigation and report: recommendations San Benito County

Sec. 7.6. the board by resolution require the district to annually prepare an investigation and report on groundwater conditions of the district and the zones thereof, for the period from October 1 of the preceding calendar year through September 30 of the current year and on activities of the district for protection and augmentation of the water supplies of the district and the zones thereof. The investigation and report shall include all of the following information:

(a) Information for the consideration of the board in its determination of the annual overdraft.

(b) Information for the consideration of the board in its determination of the accumulated overdraft as of September 30 of the current calendar year.

(c) A report as to the total production of water from the groundwater supplies of the district and the zones thereof as of September 30 of the current calendar year.

(d) An estimate of the annual overdraft for the current water year and for the ensuing water year.

(e) Information for the consideration of the board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the district and the zones thereof for the ensuing water year.

(f) The amount of water the district is obligated to purchase during the ensuing water year.

(g) A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the district and the zones thereof the ensuing water year.

(h) A recommendation as to whether or not a groundwater charge should be levied in any zone or zones of the district during the ensuing year.

(i) If any groundwater charge is recommended, a proposal of a rate per acre-foot for agricultural water and a rate per acre-foot for all water other than agricultural water for such zone or zones.

(j) Any other information the board requires.

(Added by Stats. 1965,c. 1798,p.4167, 7. Amended by Stats.1967,c.934, 5, eff. July27,1967; Stats. 1983, c. 402, 1; Stats. 1998, c. 219 (A.B.2135), 1.)

Section 70-7.7. Receipt of report; notice of hearing; contents; hearing

Sec. 7.7. (a) On the third Monday in December of each year, the groundwater report shall be delivered to the clerk of the board in writing. The clerk shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of a public hearing to be held on the second Monday of January of the following year in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding the groundwater report shall be held. The notice shall include, but is not limited to, an invitation to all operators of water producing facilities within the district to call at the offices of the district to examine the groundwater report.

(b) The board shall hold, on the second Monday of January of each year, a public hearing, at which time any operator of a water-producing facility within the district, or any person interested in the condition of the groundwater supplies or the surface water supplies of the district, may in person, or by representative, appear and submit evidence concerning the groundwater conditions and the surface water supplies of the district. Appearances also may be made supporting or protesting the written groundwater report, including, but not limited to, the engineer's recommended groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4167, 8. Amended by Stats. 1983, c. 02,2; Stats. 1998, c. 219 (A.B.2135,2.)

Section 70-7.8. Determination of groundwater charge; establishment of rates; zones; maximum charge; clerical errors

Sec. 7.8. (a) Prior to the end of the water year in which a hearing is held pursuant to subdivision (b) of Section 7.7, the board shall hold a public hearing, noticed pursuant to Section 6061 of the government Code, to determine if a groundwater charge should be levied, it shall levy, assess, and affix such a charge or charges against all persons operating groundwater- producing facilities within the zone or zones during the ensuing water year. The charge shall be computed at fixed and uniform rate per acre-foot for agricultural water, and at a fixed and uniform rate per acre-foot for all water other than agricultural water. Different rates may be established in different zones. However, in each zone, the rate for agricultural water shall be fixed and uniform and the rate for water other than agricultural water shall be fixed and uniform. The rate for agricultural water shall not exceed one-third of the rate for all water other than agricultural water.

(b) The groundwater charge in any year shall not exceed the costs reasonably borne by the district in the period of the charge in providing the water supply service authorized by this act in the district or a zone or zones thereof.

(c) Any groundwater charge levied pursuant to this section shall be in addition to any general tax or assessment levied within the district or any zone or zones thereof.

(d) Clerical errors occurring or appearing in the name of any person or in the description of the water-producing facility where the production of water there from is otherwise properly charged, or in the making or extension of any charge upon the records which do not affect the substantial rights of the assesse or assesses, shall not invalidate the groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4168, 9. Amended by Stats. 1983, c. 402, 3; Stats.1983, c. 402, 3; Stats. 1998, c. 219 (A.B.2135), 3.)

B CLIMATE DATA

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Figure B-1. Annual Precipitation in Hollister

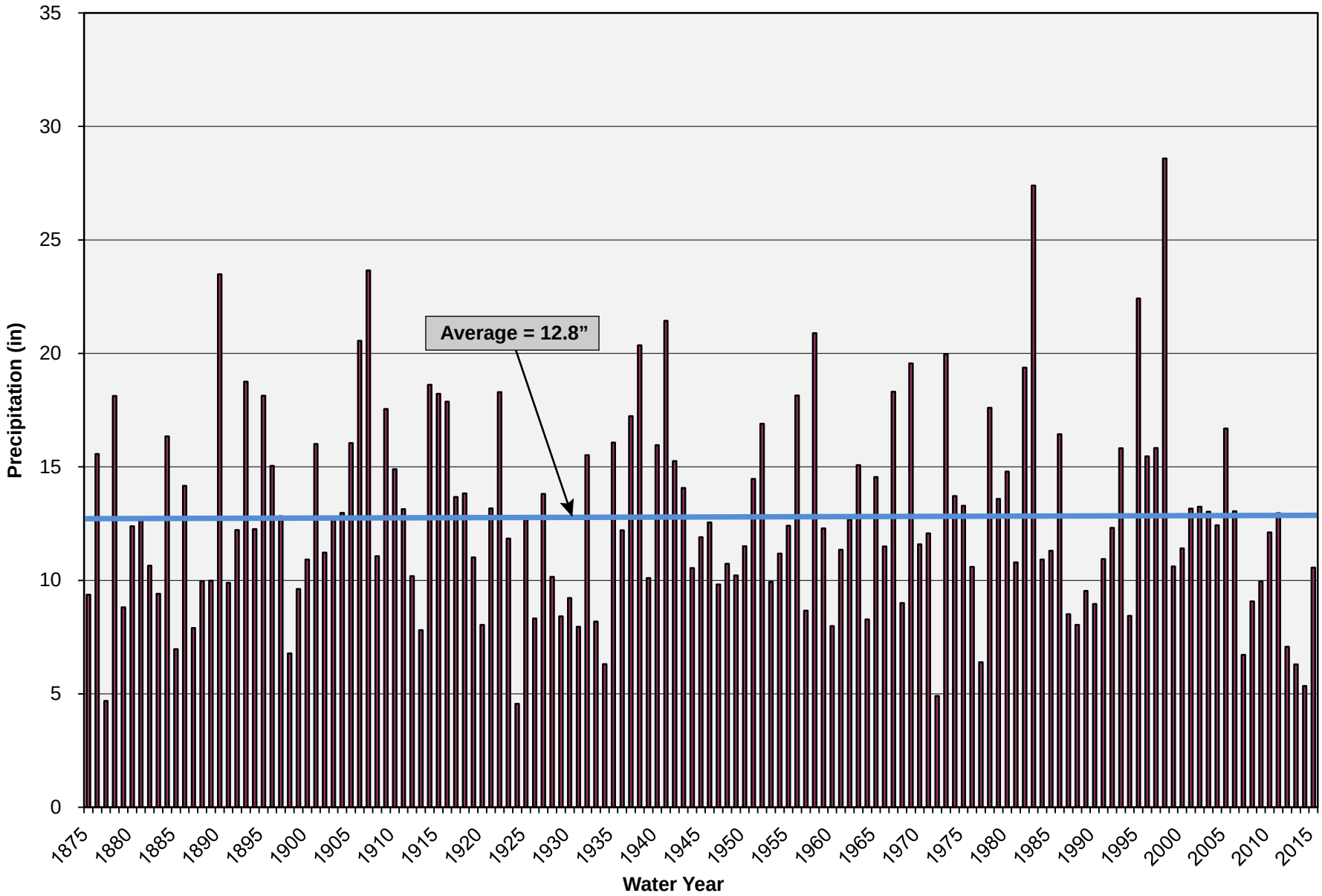
Table B-1a. Monthly Precipitation at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	0.1	0	2.2	4.4	4.5	1.6	1.3	1.3	0	0	0	0	**15.5**	**119%**
1997	1.0	3.2	4.3	6.8	0.2	0.1	0.2	0	0.1	0	0	0	**15.9**	**122%**
1998	0.2	3.8	2.6	4.9	9.1	2.7	2.3	2.4	0.1	0	0	0.1	**28.1**	**216%**
1999	0.5	1.9	0.8	2.5	2.5	1.5	0.7	0.1	0.1	0	0	0	**10.6**	**81%**
2000	0.1	1.0	0.1	4.1	4.5	0.7	0.4	0.5	0.1	0	0	0	**11.5**	**88%**
2001	3.5	0.8	0.2	2.9	2.8	0.6	2.2	0	0	0	0	0	**13.1**	**100%**
2002	0.7	11.5	11.9	0.7	1.2	1.6	0.4	0.3	0	0	0	0	**28.1**	**216%**
2003	0.0	1.7	5.0	0.8	1.4	1.1	3.1	0.1	0	0	0.1	0	**13.1**	**101%**
2004	0.2	0.6	5.3	1.3	4.2	0.6	0.3	0.1	0	0	0	0	**12.5**	**96%**
2005	2.0	0.5	3.5	2.5	2.9	3.4	0.8	0.6	0.4	0	0	0	**16.7**	**128%**
2006	0.1	0.3	3.1	1.5	1.0	5.0	1.7	0.4	0	0	0	0	**13.0**	**100%**
2007	0.2	0.7	1.7	0.6	2.2	0.3	0.6	0	0	0	0	0.4	**6.7**	**52%**
2008	0.7	0.7	0.9	4.6	2.1	0.1	0.1	0	0	0	0	0	**9.1**	**70%**
2009	0.3	1.1	1.9	0.4	3.7	1.8	0.2	0.5	0	0	0	0.2	**10.0**	**76%**
2010	0.5	0	1.3	2.3	2.2	1.7	3.4	0.6	0	0	0	0	**12.1**	**93%**
2011	0.7	1.9	2.6	1.6	2.6	2.3	0.2	0.8	0	0	0	0	**13.0**	**99%**
2012	0.7	1.0	0.1	0.8	0.5	2.3	1.4	0.3	0	0	0	0	**7.1**	**54%**
2013	0.0	2.2	1.2	1.4	0.6	0.5	0.3	0.0	0	0	0	0	**6.3**	**48%**
2014	0.1	0.4	0.2	0.2	1.9	1.6	0.9	0.0	0	0	0	0	**5.4**	**41%**
2015	1.6	0.5	5.8	0.0	1.2	0.2	0.2	0.9	0.0	0.0	0.1	0.1	**10.6**	**82%**
AVG	**0.7**	**1.7**	**2.7**	**2.2**	**2.6**	**1.5**	**1.0**	**0.4**	**0.1**	**0.0**	**0.0**	**0.1**	**12.9**	**100%**

Table B-1b. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	3.9	2.2	1.2	1.5	1.9	3.7	5.1	6.1	6.7	7.4	6.7	4.7	**51.0**	**105%**
1997	3.8	1.8	1.4	1.4	2.5	4.3	5.8	7.5	7.1	7.2	6.7	5.7	**55.2**	**113%**
1998	3.9	1.8	1.5	1.3	1.4	2.8	4.3	4.5	5.3	6.9	6.8	4.7	**45.2**	**93%**
1999	3.5	1.7	1.5	1.5	1.8	3.0	4.7	5.8	6.7	6.9	5.9	4.7	**47.8**	**98%**
2000	4.0	2.0	1.9	1.2	1.6	3.7	5.1	6.0	6.7	6.7	6.2	4.7	**50.0**	**103%**
2001	2.9	1.7	1.5	1.5	1.8	3.1	3.9	6.2	6.5	6.0	6.2	4.8	**46.0**	**94%**
2002	3.5	1.9	1.2	1.5	2.3	3.7	4.2	6.4	7.1	7.2	6.1	5.4	**50.5**	**104%**
2003	3.6	1.9	1.3	1.6	1.8	3.9	3.8	6.0	6.5	7.3	6.2	5.1	**48.8**	**100%**
2004	4.1	1.7	1.2	1.3	1.7	4.0	5.2	6.4	6.7	6.6	6.0	5.3	**50.3**	**103%**
2005	3.1	1.7	1.4	1.3	1.7	3.0	4.4	5.7	6.4	6.9	6.1	4.6	**46.2**	**95%**
2006	3.6	2.0	1.2	1.4	2.2	2.4	3.0	5.5	6.4	7.0	5.6	4.4	**44.7**	**92%**
2007	3.3	1.7	1.4	1.8	1.8	4.1	4.8	6.3	6.9	6.8	6.5	4.7	**49.8**	**102%**
2008	3.5	2.2	1.4	1.3	2.0	3.8	5.2	6.0	6.9	6.7	6.3	5.0	**50.2**	**103%**
2009	3.8	1.9	1.4	1.7	1.7	3.5	4.8	5.5	6.3	7.1	6.3	5.3	**49.3**	**101%**
2010	3.5	2.2	1.7	1.3	1.8	3.5	3.9	5.4	6.7	6.3	5.9	5.0	**47.0**	**96%**
2011	3.0	1.9	1.1	1.6	2.1	2.7	4.4	5.3	6.0	6.6	5.7	4.6	**45.0**	**92%**
2012	3.3	1.9	1.8	1.8	2.5	3.3	4.4	6.4	6.8	6.6	6.0	4.6	**49.5**	**101%**
2013	3.3	1.8	1.2	1.5	2.1	3.7	5.4	6.3	6.4	6.5	6.0	4.8	**48.8**	**100%**
2014	3.5	2.0	1.8	2.1	1.9	3.6	4.9	6.8	6.6	6.4	6.0	4.7	**50.4**	**103%**
2015	3.9	1.9	1.5	1.8	2.2	4.1	5.1	5.0	6.4	6.5	6.5	5.3	**50.2**	**103%**
AVG	3.5	1.9	1.4	1.5	1.9	3.5	4.6	6.0	6.6	6.8	6.2	4.9	**48.7**	**100%**

Note: The averages are for the available period of record, starting in 1875 for precipitation and 1995 for reference evapotranspiration.



December 2015

TODD GROUNDWATER

Figure B-1
Annual Precipitation in Hollister (1875 - 2015)

C HYDROLOGICAL DATA

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Figure C-4. Depth to Water October 2015

Figure C-5. Groundwater Elevations October 2014

Figure C-6. Profiles of Historical Groundwater Levels

Table C-1. Miscellaneous Streamflow Measurements during Water Year 2015

	Streamflow Measurement Site	Flow (cfs)				
		Oct-14	Jan-15	Apr-15	Jul-15	Oct-15
1	Tres Pinos Cr - Southside Road Bridge	0	0	0	0	0
2	San Benito River - KT Road Bridge	0	0	0	0	0
3	San Benito River - Hospital Road	0	0	0	0	0
4	San Benito River - Cienega Road	0	0	0	0	0
5	San Benito River - Nash Road	0	0	0	0	0
6	San Benito River - old Highway 156	0	0	0	0	0
7	San Benito River - near Flint Road	0	0	0	0	0
8	San Benito River - near Mitchell Road	0	0	0	0	0
9	San Benito River - upstream of Bixby Road	0	0	0	0	0
10	San Benito River - Y Road	0	0	0	0	0
11	San Juan Creek - San Juan-Hollister Road	0	0	0	0	0
12	San Juan Creek - Highway 156	0	0	0	0	0
13	San Juan Creek - Anzar Road	0	0	0	0	0
14	San Juan Creek - 2000 ft downstream of HWY 101					
15	Pacheco Creek - Walnut Avenue	0	0	0	0	0
16	Pacheco Creek - Highway 156	0	0	0	0	0
17	Pacheco Creek - Lovers Lane	0	0	0	0	0
18	Arroyo de las Viboras - Hawkins Ranch driveway	0	0	0	0	0
19	Arroyo de las Viboras - Fairview Road	0	0	0	0	0
26	Arroyo Dos Picachos - Lone Tree Road	0	0	0	0	0
20	Arroyo Dos Picachos - Fallon Road	0	0	0	0	0
21	Arroyo Dos Picachos - Aquistapace Road	0	0	0	0	0
22	Santa Ana Creek - Fairview Road	0	0	0	0	0
23	Santa Ana Creek - Fallon Road	0	0	0	0	0
24	Tequisquita Slough - San Felipe Road	0	0	0	0	0
25	Millers Canal - 2000 ft downstream of San Felipe Lake	Locked Out	Locked Out	Locked Out	Locked Out	Locked Out
27	Pajaro River - above Millers Canal					
28	Pajaro River - Highway 25					
29	Pajaro River - below Carnadero Cr					
30	Carnadero Cr - above Pajaro River					

Notes:

See Figure C-3 for numbered site locations

~ = streamflow estimated visually or by relatively inaccurate methods (e.g., width x depth x estimated centerline surface velocity)

Sites were monitored within days in the cited month;
Most sites along any individual stream were measured on the same day.

Table C-2. Groundwater Elevations October 2014 through October 2015

Well Number	Well Depth (feet)	Depth to Top of Screens (feet)	Ground Surface Elevation (feet MSL)	Subbasin	Key Well	Groundwater Elevations (feet MSL)				
						Oct-14	Jan-15	Apr-15	Jul-15	Oct-15
Bolsa SE										
12-5-09M1	240	105	207	BSE	*	121.56	122.24	120.87		114.64
12-5-21Q1	500	0	260	BSE	*	70.58	71.35	70.72		67.64
12-5-22N1	372	250	265	BSE	*	86.9	89.4	90.32		85.15
Hollister East										
12-5-14N1	0	0	229	HE	*	178.85	177.87	177.54	176.61	176.87
12-5-22C1	237	102	236	HE		186.27	186.64	187.68	187.35	192.87
12-5-22J2	355	120	250	HE	*	188.62	188.75	189.32	188.84	194.64
12-5-23A20	862	178	239	HE	*	187.87	186.62		187.64	185.32
12-5-24N1	300	182	270	HE	*	180.54	179.87	181.26	180.54	188.12
12-6-07P1	147	0	266	HE		225.86	226.32	227.26	225.35	224.2
12-6-18G1	198	70	303	HE		252.54		266.88	265.52	248.91
12-6-30E1	0	0	375	HE		341.19	341.12	342.04	340.9	349.02
13-6-07D2	0	0	500	HE		334.62	334.22	334.71	334.12	335.02
ROSSI 1	0	0	0	HE		223.62	222.88	223.74	221.15	222.43
2317	0	0	299.5	HEN		227.64	227.62	227.32	226.97	232.86
Hollister West										
12-5-27E1	175	0	270	HW	*	190.88	193.68	194.51	198.64	190.54
12-5-28J1	220	0	276	HW	*	206.92	205.88	206.14	204.25	203.59
12-5-33E2	121	81	266	HW	*	201.05	199.64	200.32	197.25	191.32
12-5-34P1	195	153	294	HW	*	204.24	205.24	204.24	203.35	202.57
12-5-35N2	612	288	305	HW	*	215.75	216.76	217.54	217.15	215.87
13-5-03L1	126	0	303	HW	*	224.54	225.63	226.64	224.61	223.86
13-5-04B	0	0	285	HW		207.76	209.39	210.71	207.05	204.82
13-5-10B1	0	0	305	HW	*	216.86	218.75	219.15	218.02	217.59
13-5-11E1	0	0	309	HW		255.49	261.63	266.62	244.21	243.61
San Justo 4 (INDART)	0	0	318	HW		256.68	257.32	257.76	256.64	254.54
San Justo 6 (ROSE)	0	0	338	HW		232.62	230.64	234.22	233.35	231.86
Pacheco										
11-5-26N2	232	95	198	P	*	155.28	156.86	155.68	153.42	150.62
11-5-26R3	225	65	208	P	*	169.49	170.83	171.02	168.54	166.77
11-5-35C1	180	0	198	P	*	158.49	159.88	158.63	155.64	155.88
11-5-35G1	230	0	206	P	*	168.23	170.55	170.79	165.81	161.35
11-5-35Q3	0	0	203	P	*	157	157.02	158.64	155.52	152.44
11-5-36C1	98	0	223	P	*	176.1	176.87	178.63	175.63	174.64
11-6-31M2	188	155	284	P	*	201.36	203.24	203.43	201.64	200.59
12-5-01G2	300	0	215	P		174.32	174.52	174.15	173.77	172.42
12-5-02H5	128	42	210	P		170.5	170.34	170.89	170.54	165.67
12-5-02L2	170	0	202	P		186.04	185.94	186.57	181.76	179.87
12-5-03B1	128	100	182	P	*	182	182	182	182	182
12-6-06K1	260	16	260	P		260	260	260	259.99	259.99
12-6-06L4	235	50	248	P		212.88	211.87	214.56	211.88	212.9

Table C-2. Groundwater Elevations October 2014 through October 2015

Well Number	Well Depth (feet)	Depth to Top of Screens (feet)	Ground Surface Elevation (feet MSL)	Subbasin	Key Well	Groundwater Elevations (feet MSL)				
						Oct-14	Jan-15	Apr-15	Jul-15	Oct-15
San Juan										
12-4-17L20	0	0	140	SJ		113.63	111.68	110.99		113.64
12-4-18J1	0	0	150	SJ		120.79	121.57	120.85		116.74
12-4-21M1	250	0	170	SJ	*	137.2	138.82	137.87		126.59
12-4-26G1	876	240	210	SJ	*	169.62	170.22	169.88		165.88
12-4-34H1	387	120	199	SJ	*	135.16	136.65	136.75		132.74
12-4-35A1	325	110	216	SJ		168.12	169.45	170.61		163.87
12-4-36D2	0	0	219	SJ		177.88	177.62	177.92		171.82
12-5-30H1	240	0	250	SJ		189.42	188.88	189.02		186.82
12-5-31H1	0	0	248	SJ		192.11	190.64	191.88		187.84
13-4-03H1	312	168	206.25	SJ		188.24	188.44	188.87		182.85
13-4-4A3	0	0	210	SJ		187.64	188.63	189.54		182.82
RIDER BERRY	0	0	241.5	SJ		215.13	184.14			175.04
Tres Pinos										
13-5-11Q1	178	61	324	TP		235.51	236.64	236.53	234.39	231.61
13-5-12D4	0	0	360	TP		240	243	231	244	198
13-5-12K1	0	0	440	TP		314	316	316	316	314
13-5-12N20	352	301	332	TP	*	308.83	310.24	309.27	306.12	300.54
13-5-13F1	134	30	348	TP	*	319.88	320.61	318.64	315.54	311.12
13-5-13H1	252	112	400	TP	*	327.64	328.57	327.24	325.79	322.52
13-5-13J2	180	0	375	TP	*	355.75	356.24	305.62	304.26	302.88
13-5-13Q1	185	44	360	TP	*	316.22	318.61	317.72	315.36	312.83
13-5-14C1	0	0	365	TP		261.01	262.64	263.13	254.77	252.52
13-6-19J1	340	128	450	TP		416.72	418.11	419.35	416.21	413.89
13-6-19K1	211	0	422	TP	*	351.23	353.45	355.71	351.9	348.54
13-6-20K1	0	0	440	TP		426.73	427.34	425.86	424.44	422.14
LEMOS (Ridgemark)	0	0	522	TP		339.26	340.14	341.55	340.76	338.26
POSEY (Ridgemark)	0	0	521	TP		330.42	332.22	333.15	332.14	331.46
Bolsa										
11-4-34A1	100	0	142	B	*		132.43	131.9		124.72
11-5-20N1	300	0	150	B	*	86.32	92.62	93.68		87.64
11-5-21E2	220	100	155	B		155	155	155	155	155
11-5-28B1	198	125	168	B		168	168	168	168	168
11-5-28P4	140	80	165	B		165	165	165	165	165
11-5-31F1	515	312	159	B	*	36.3	46.54	45.17		43.64
11-5-33B1	125	0	169	B		169	169	169	169	169
12-5-05G1	500	150	175	B		102.99	106.35	105.66		103.24
12-5-05M1	0	0	175	B		63.89	64.15	65.12		59.82
12-5-06L1	0	0	177	B	*	144.15	146.52	145.77		145.74

Table C-2. Groundwater Elevations October 2014 through October 2015

Well Number	Well Depth (feet)	Depth to Top of Screens (feet)	Ground Surface Elevation (feet MSL)	Subbasin	Key Well	Groundwater Elevations (feet MSL)				
						Oct-14	Jan-15	Apr-15	Jul-15	Oct-15
Paicines										
OAK HILL RANCH 1	0	0	745	Paicines		656.73		656.64		653.79
RFP Vineyard 3 (FRANCHIONI)	0	0	706.67	Paicines		645.63		645.21		641.72
RIDGEMARK 5	0	0	668	Paicines		638.64		637.51		630.88
RIDGEMARK 7	0	0	692	Paicines		560.74		594.87		588.26
SCHIELDS 4 (vineyard)	0	0	682	Paicines		628.38		631.39		627.35
Pacheco Creek										
11-5-13D1	125	0	258	PC	*	205.57	214.19	213.71	211.62	209.51
11-5-23R2	118	43	230	PC	*	187	189.12	188.71	183.63	181.61
11-5-24L1	70	0	234	PC	*	183.3	183.92	183.82	181.56	174.76
11-5-25G1	225	0	244.33	PC	*	171.95	171.57	172.48	219.97	217.15
Tres Pinos Creek Valley										
1536	0	0	0	TCPV		289	291	290	289	280
DONATI 2	0	0	696	TPCV		641.35		643.86		637.72
GRANITE ROCK WELL 1	0	0	0	TPCV		300.47	301.22	293.64	283.89	282.54
GRANITE ROCK WELL 2	0	0	0	TPCV		328.54	327.98	318.71	308	306.72
WILDLIFE CENTER 5	0	0	766	TPCV		699.72		695.86		688.74
Llagas										
11S04E02D008	0	0	229	SCVWD		123.23	146.4	132.675	107.2733	123.56
11S04E02N001	0	0	174.9	SCVWD		125.53	143.27	126.875	94.055	119.87
11S04E03J002	0	0	196	SCVWD		123.15	146.38	126.985	98.5	120.42
11S04E08K002	0	0	178.1	SCVWD		128.72	147.2	145.11	125.615	127.1
11S04E10D004	0	0	169.9	SCVWD		124.22	146.42	136.3	112.2967	121.765
11S04E15J002	0	0	144	SCVWD		111.33	139.55	126.93	97.28667	112.25
11S04E17N004	0	0	180.1	SCVWD		123.9	146.05	145.505	129.8833	
11S04E21P003	0	0	154.9	SCVWD		118.68	139.89	130.02		113.98
11S04E22N001	0	0	149.9	SCVWD		114.75	136.29	124.645	104.09	109.82
11S04E32R002	0	0	140.1	SCVWD		105.51	129.95	120.41	100.4767	102.02

Table C-3. Groundwater Change Attributes

Subbasin	Subbasin Area (Acres)	Average Storativity
San Juan	11,708	0.05
Hollister West	6,050	0.05
Tres Pinos	4,725	0.05
Pacheco	6,743	0.03
Northern Hollister East	10,686	0.03
Southern Hollister East	5,175	0.03
Bolsa SE	2,691	0.08
Bolsa	20,003	0.01

Table C-4. Groundwater Change in Elevation 2006-2015 (feet)

	Average Change in Groundwater Elevation									
Subbasin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
San Juan	0.87	(4.49)	0.29	(0.75)	(1.39)	(0.89)	-	(10.66)	(7.95)	(9.45)
Hollister West	3.13	(1.69)	3.31	(1.43)	(1.58)	(0.66)	2.12	(5.72)	(17.41)	(3.60)
Tres Pinos	2.47	(2.34)	0.72	8.10	(10.52)	0.97	2.54	(2.48)	(6.66)	(6.68)
Pacheco	1.93	(4.41)	(1.36)	8.10	(6.60)	1.92	(4.36)	(2.95)	(7.37)	1.92
Northern Hollister East	3.64	(6.51)	(4.21)	10.15	(8.73)	2.72	(2.36)	1.65	(9.10)	0.76
Southern Hollister East	3.26	(1.46)	5.45	9.39	4.93	(1.94)	(2.18)	(1.14)	(6.87)	1.61
Bolsa SE	1.55	(6.78)	11.51	(24.80)	25.29	(11.65)	0.25	(4.27)	(10.68)	(3.34)
Bolsa	6.79	(3.30)	8.97	(16.86)	23.15	(11.19)	10.72	(3.37)	(25.56)	4.57

Table C-5. Groundwater Change in Storage 2006-2015 (acre-feet)

	Average Change in Groundwater Storage (AF)									
Subbasin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
San Juan	510	(2,626)	168	(437)	(811)	(523)	-	(6,239)	(4,653)	(5,530)
Hollister West	947	(510)	1,001	(431)	(477)	(198)	640	(1,730)	(5,267)	(1,090)
Tres Pinos	584	(553)	169	1,913	(2,485)	228	601	(586)	(1,574)	(1,579)
Pacheco	391	(892)	(275)	1,639	(1,335)	389	(882)	(597)	(1,490)	388
Northern Hollister East	1,167	(2,087)	(1,350)	3,253	(2,798)	870	(757)	528	(2,918)	242
Southern Hollister East	506	(227)	846	1,457	766	(301)	(339)	(177)	(1,067)	250
Bolsa SE	333	(1,458)	2,478	(5,338)	5,443	(2,508)	53	(918)	(2,300)	(719)
Bolsa	1,358	(659)	1,794	(3,372)	4,631	(2,239)	2,144	(674)	(5,112)	915

DWR Groundwater Basins

3-2 Pajaro Valley
3-3 Gilroy Hollister Valley
- 3-3.02 Bolsa Area
- 3-3.03 Hollister Area
- 3-3.04 San Juan Bautista Area

3-22 Santa Ana Valley
3-23 Upper Santa Ana Valley
3-24 Quien Sabe Valley
3-25 Tres Pinos Valley
3-28 San Benito River Valley
3-29 Dry Lake Valley
3-30 Bitter Water Valley
3-31 Hernandez Valley
5-23 Panoche Valley
5-71 Vallecitos Valley

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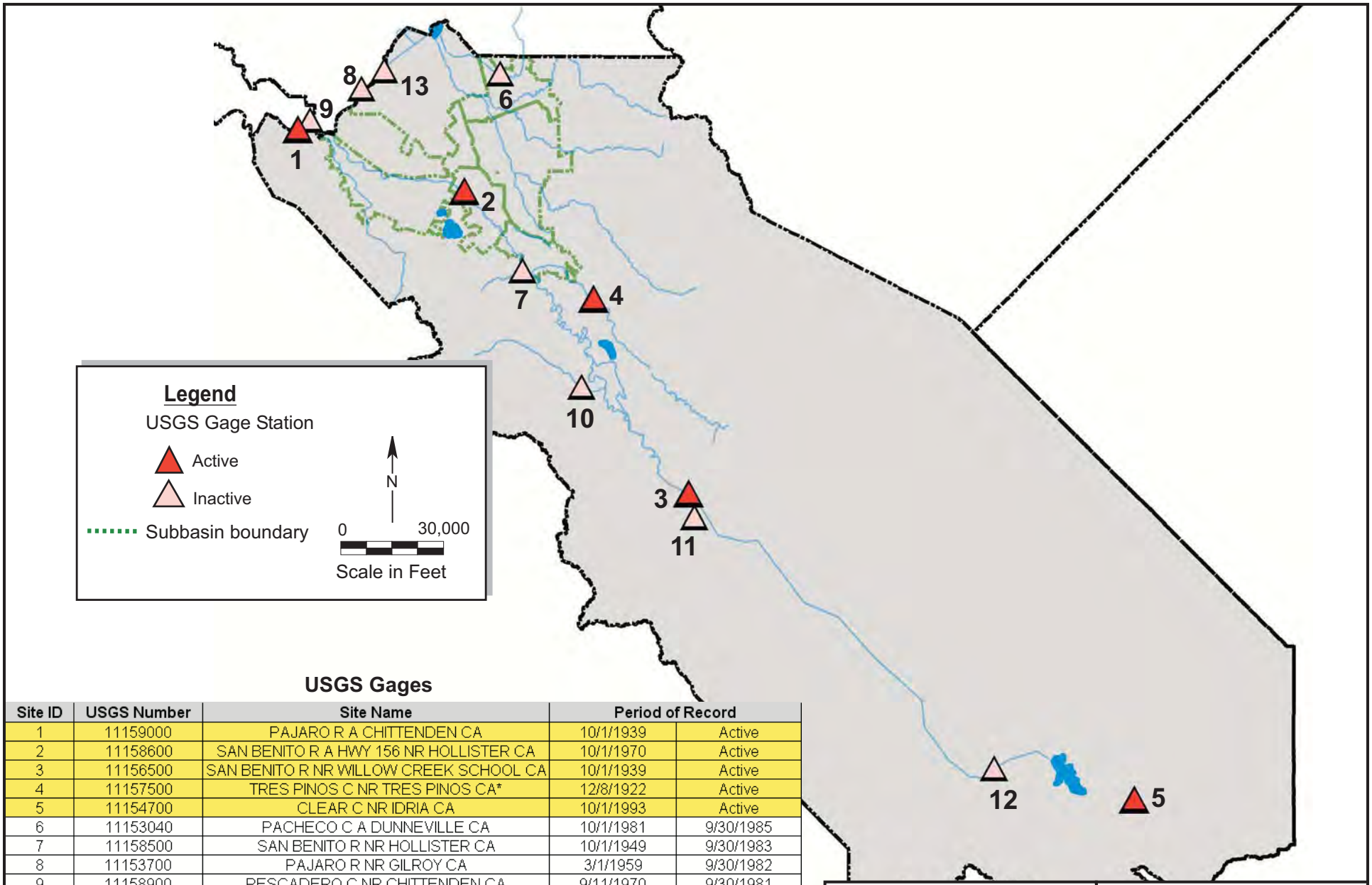
Figure C-1
Groundwater Basins in San Benito County



USGS Gages

Site ID	USGS Number	Site Name	Period of Record	
1	11159000	PAJARO R A CHITTENDEN CA	10/1/1939	Active
2	11158600	SAN BENITO R A HWY 156 NR HOLLISTER CA	10/1/1970	Active
3	11156500	SAN BENITO R NR WILLOW CREEK SCHOOL CA	10/1/1939	Active
4	11157500	TRES PINOS C NR TRES PINOS CA*	12/8/1922	Active
5	11154700	CLEAR C NR IDRIA CA	10/1/1993	Active
6	11153040	PACHECO C A DUNNEVILLE CA	10/1/1981	9/30/1985
7	11158500	SAN BENITO R NR HOLLISTER CA	10/1/1949	9/30/1983
8	11153700	PAJARO R NR GILROY CA	3/1/1959	9/30/1982
9	11158900	PESCADERO C NR CHITTENDEN CA	9/11/1970	9/30/1981
10	11156700	PESCADERO C NR PAICINES CA	7/1/1959	10/7/1970
11	11156450	WILLOW C TRIB NR SAN BENITO CA	7/1/1964	9/30/1969
12	11156000	SAN BENITO R BL M C NR HERNANDEZ CA	10/1/1949	9/30/1963
13	11154500	PAJARO R A SARGENT CA	10/1/1940	9/30/1941

* WY 2006 data for gage height only

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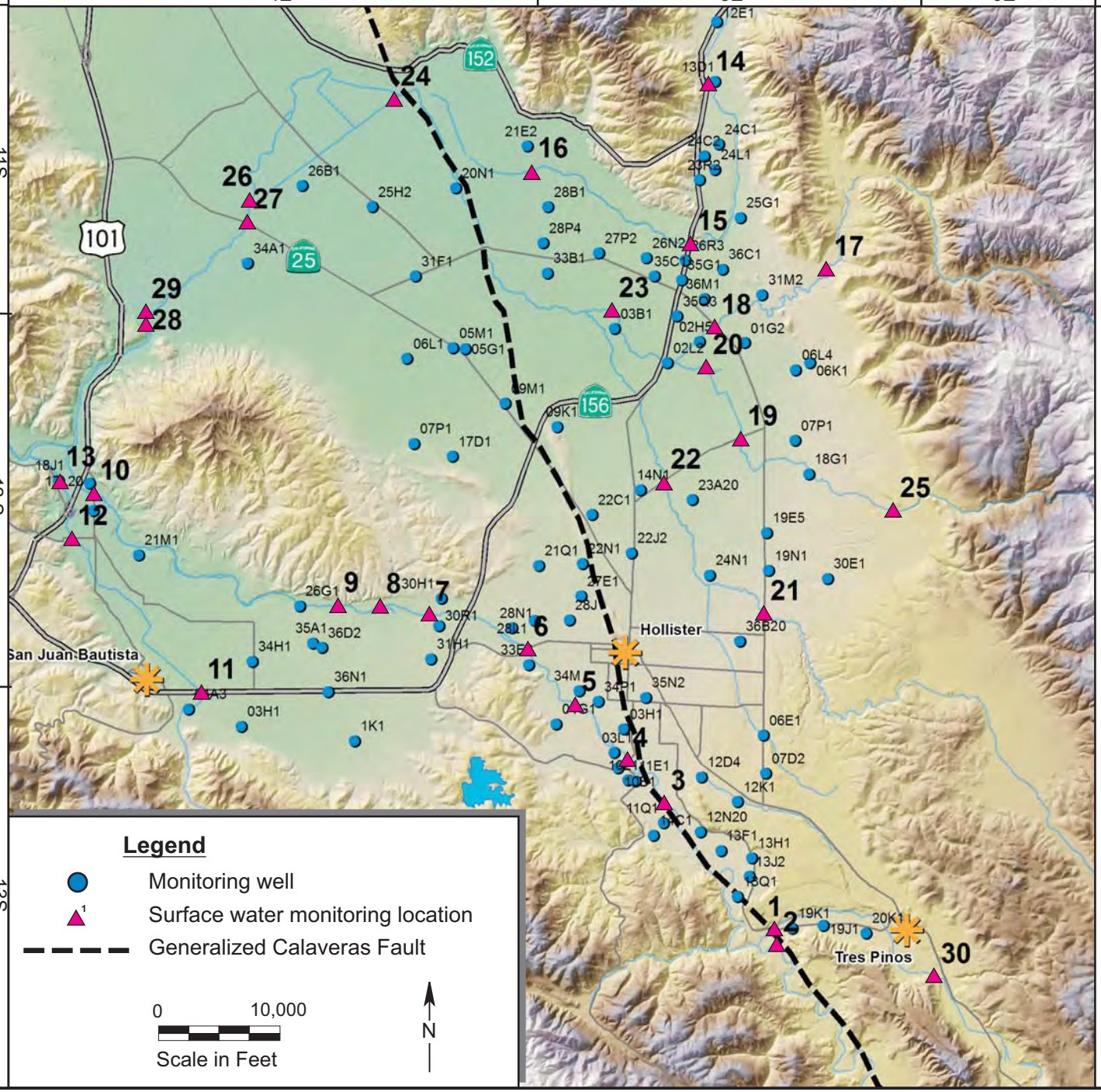
Figure C-2
Location of Streamflow Stations



Surface Water Monitoring Locations

1. Tres Pinos Cr - Southside Road Bridge (West)
2. San Benito River - KT Road bridge
3. San Benito River - Hospital Road
4. San Benito River - Cienega Road
5. San Benito River - Nash Road
6. San Benito River - Old Highway 156
7. San Benito River - near Mitchell Road
8. San Benito River - near Flint Road
9. San Benito River - upstream of Bixby Road
10. San Benito River - Y Road
11. San Juan Creek - - Highway 156
12. San Juan Creek - Anzar Road
13. San Juan Creek - 2000 ft downstream of Highway101
14. Pacheco Creek - Walnut Avenue
15. Pacheco Creek - Highway 156
16. Pacheco Creek - Lovers Lane
17. Arroyo de las Viboras - Hawkins Ranch driveway
18. Arroyo de las Viboras - Fairview Road
19. Arroyo Dos Picachos - Fallon Road
20. Arroyo Dos Picachos - Aquistapace Road
21. Santa Ana Creek - Fairview Road
22. Santa Ana Creek - Fallon Road
23. Tequisquita Sough - San Felipe Road
24. Millers Canal - 2000 ft downstream of San Felipe Lake
25. Arroyo Dos Picachos - Lone Tree Road
26. Pajaro River - above Millers Canal
27. Pajaro River - Highway 25
28. Pajaro River - below Carnadero Creek
29. Carnadero Creek - above Pajaro River
30. Tres Pinos Creek - Bolado Park

Figure C-3
Monitoring Locations

December 2015

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Path: T:\Projects\San Benito Annual 37636\2015 Annual Report\GIS\Maps\Figure C-4 - Depth to Water Map Oct 2015.mxd

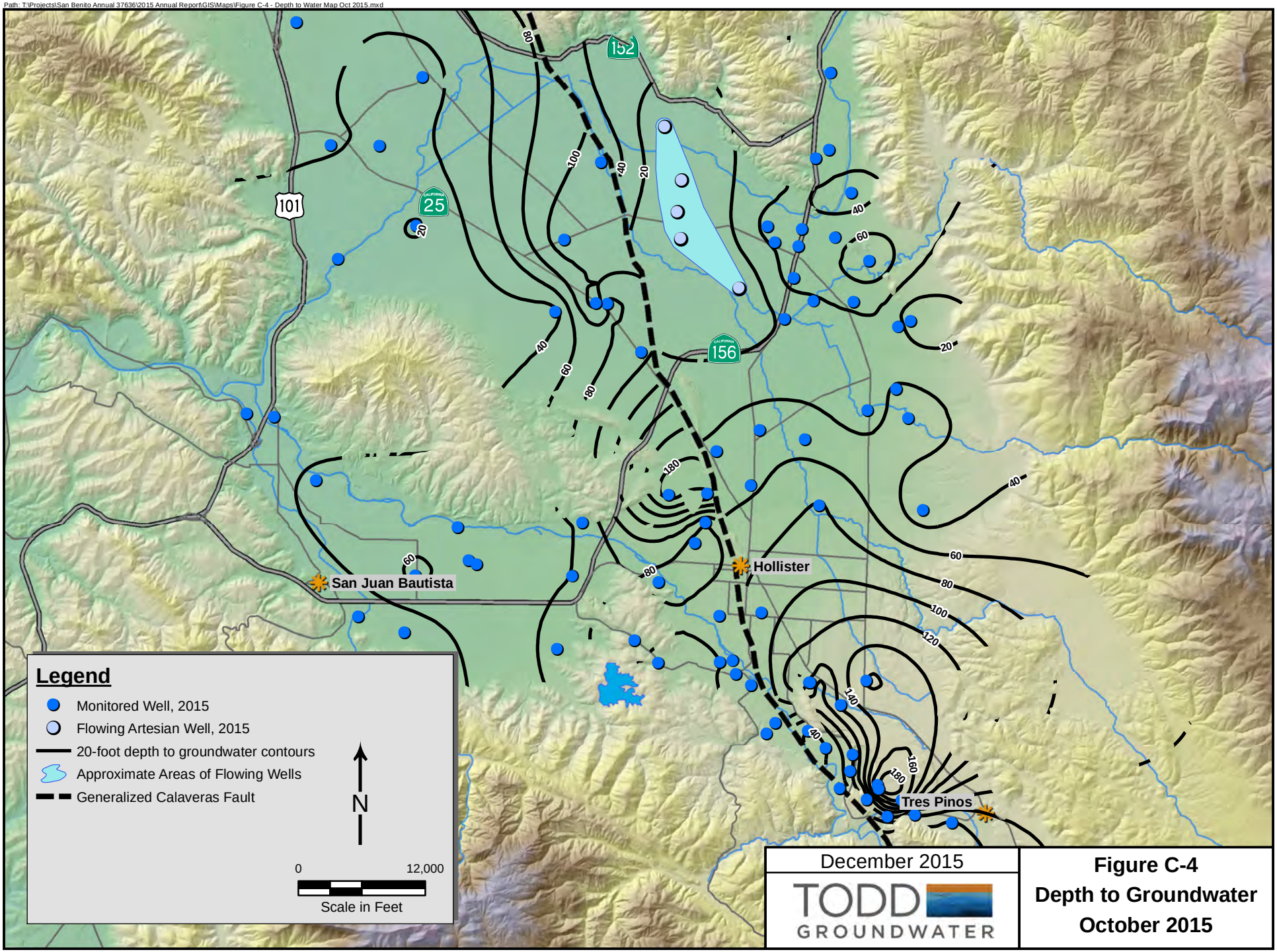


Figure C-4
Depth to Groundwater
October 2015

Path: T:\Projects\San Benito Annual 37636\2015 Annual Report\GIS\Maps\Figure C-5 - Groundwater Elevation Map Oct 2014.mxd

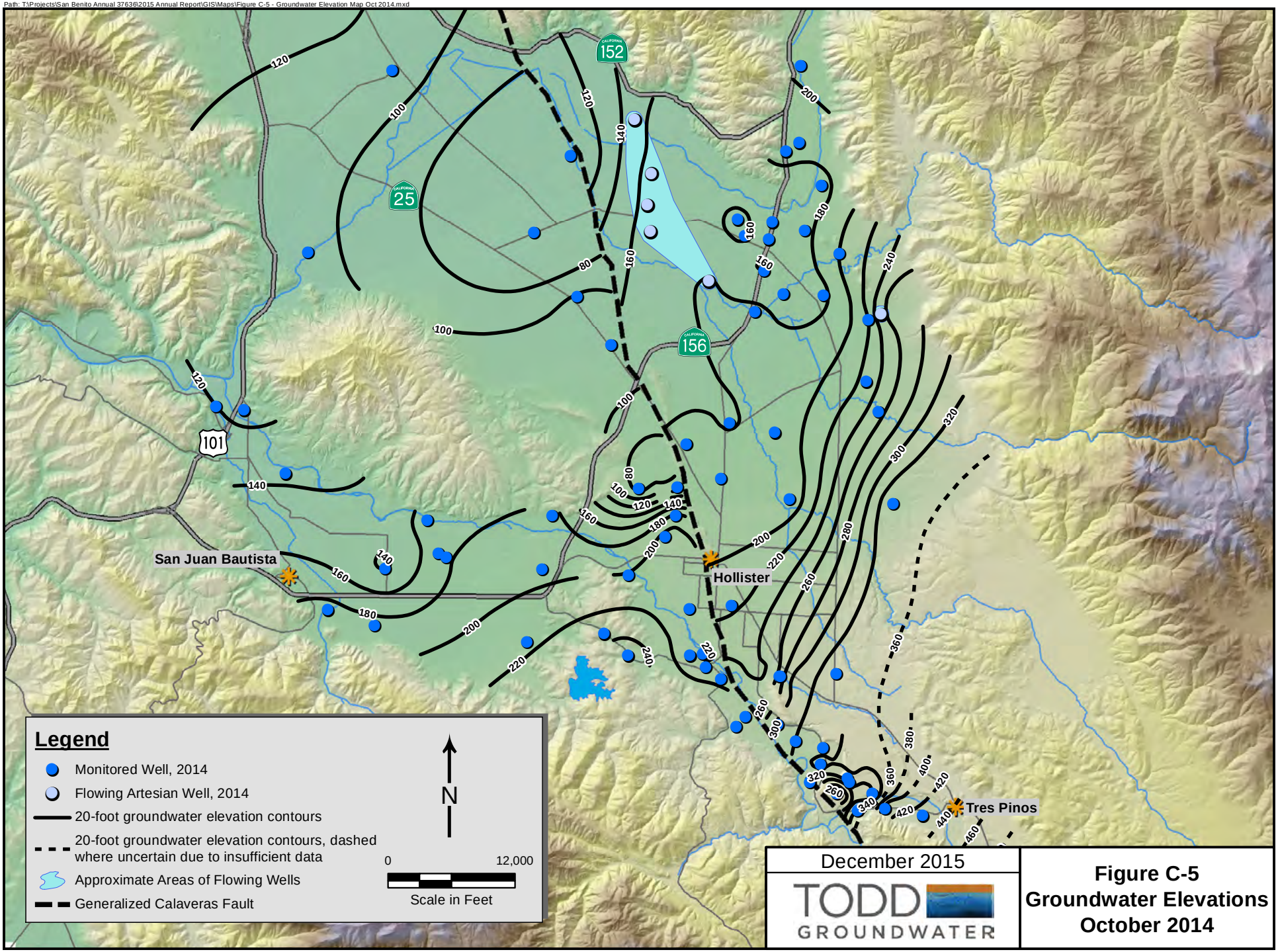
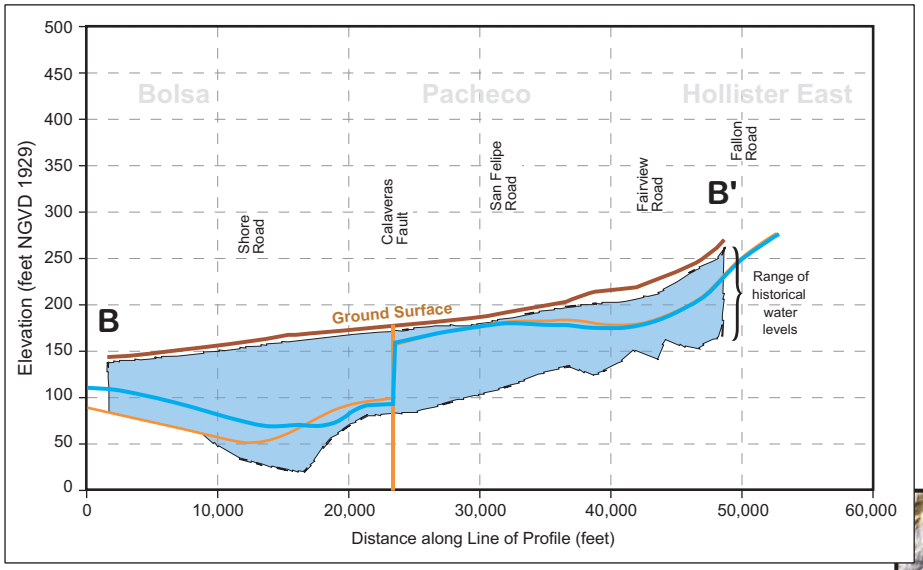
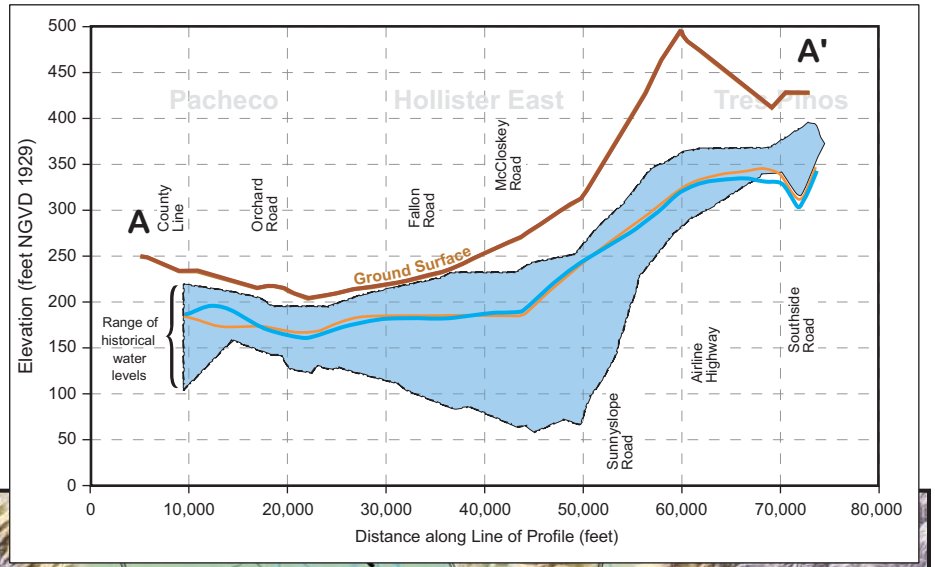
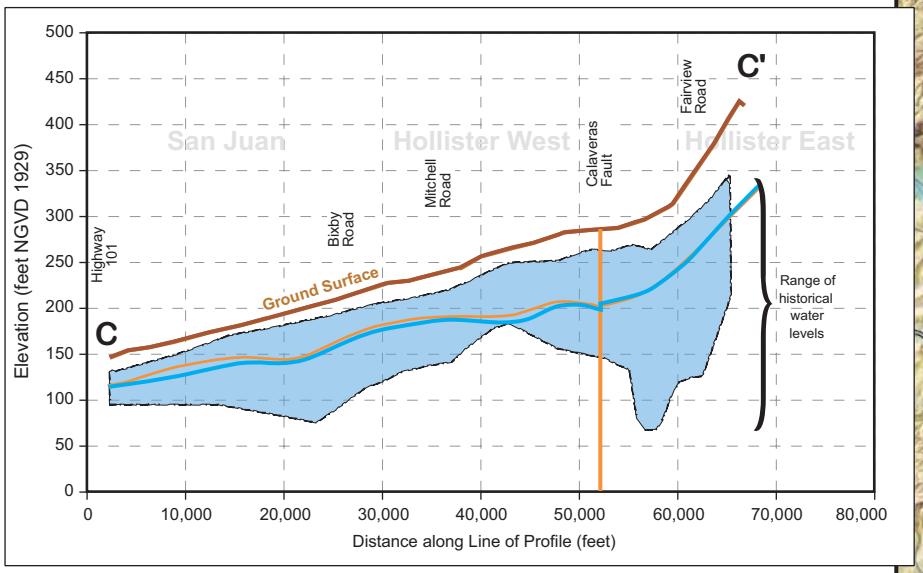
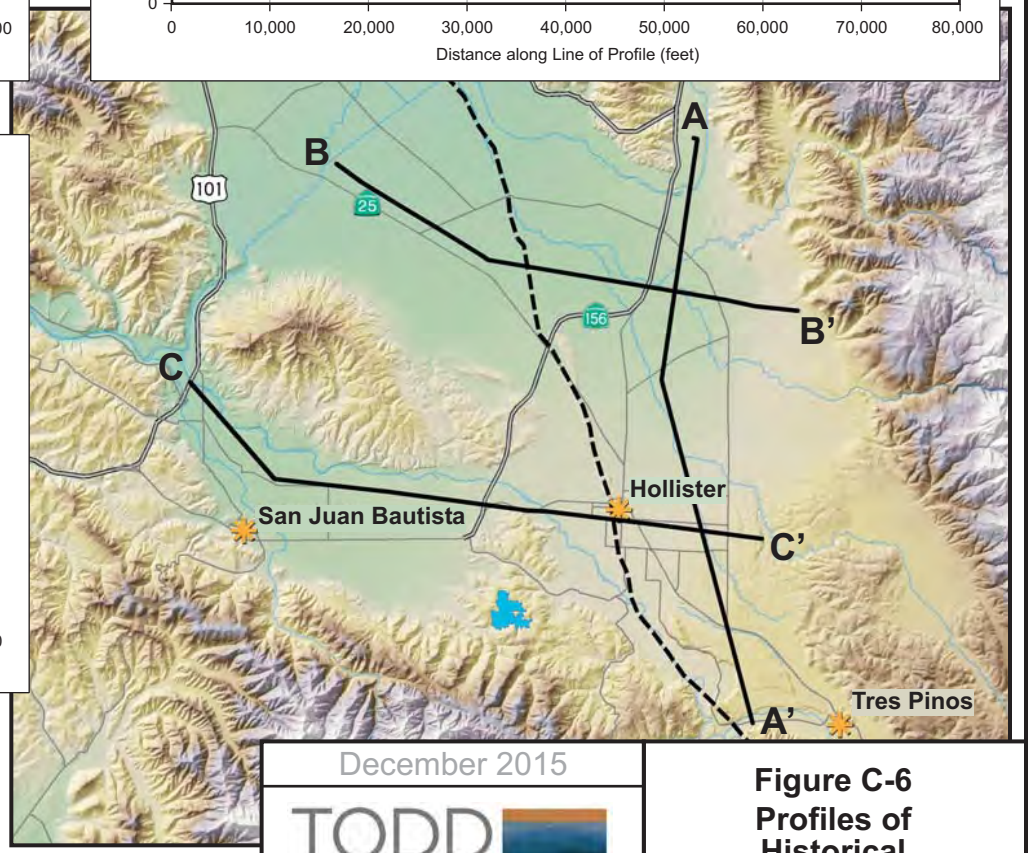


Figure C-5
Groundwater Elevations
October 2014









Legend

- Ground Surface
- Water year 2014
- Water Year 2015
- Range of Historical Water Levels

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Figure C-6
Profiles of Historical Groundwater Levels

D PERCOLATION DATA

List of Tables and Figures

Table D-1. Reservoir Water Budgets for Water Year 2015 (acre-feet)

Table D-2. Historical Reservoir Releases (AFY)

Table D-3. Historical Percolation of CVP Water (AFY)

Table D-4. Percolation of Municipal Wastewater during Water Year 2015

Table D-5. Historical Percolation of Municipal Wastewater (AFY)

Figure D-1. Reservoir Releases for Percolation

Figure D-2. Wastewater Percolation by WWTP

Table D-1. Reservoir Water Budgets for Water Year 2015 (acre-feet)

	Hernandez	Paicines	San Justo
Inflows			
Rainfall	7	6	146
San Benito River	338	0	n.a.
Hernandez-Paicines transfer	n.a.	0	n.a.
San Felipe Project	n.a.	n.a.	3,110
Total Inflows	**345**	**6**	**3,255**
Outflows			
Hernandez spills	0	n.a.	n.a.
Hernandez-Paicines transfer	0	0	n.a.
Tres Pinos Creek percolation releases	n.a.	0	n.a.
San Benito River percolation releases	0	n.a.	n.a.
CVP Deliveries	n.a.	n.a.	3,205
Evaporation and seepage	376	6	1,049
Total Outflows	**376**	**6**	**4,253**
Storage Change			
Reservoir capacity	17,200	2,870	10,308
Maximum storage	338	0	6,694
Minimum storage	323	0	3,206
Net water year storage change	**-30**	**0**	**-997**
Unaccounted for Water	**0**	**0**	**1**

Table D-2. Historical Reservoir Releases (AFY)

WY	Hernandez	Paicines	TOTAL
1996	13,535	6,139	19,674
1997	3,573	2,269	5,842
1998	26,302	450	26,752
1999	12,084	1,293	13,377
2000	13,246	2,326	15,572
2001	12,919	3,583	16,502
2002	9,698	310	10,008
2003	5,434	-	5,434
2004	3,336	-	3,336
2005	19,914	677	20,591
2006	14,112	196	14,308
2007	12,022	1,254	13,276
2008	7,646	495	8,141
2009	4,883	-	4,883
2010	8,484	4,147	12,631
2011	9,757	2,397	12,154
2012	6,341	1,321	7,662
2013	3,963	677	4,640
2014	-	-	-
2015	-	-	-
AVG	**9,362**	**1,377**	**10,739**

Table D-3. Historical Percolation of CVP Water (AFY)

Water Year	Pacheco Creek	Arroyo de las Viboras			Arroyo Dos Picachos			Santa Ana Creek				Tres Pinos Creek	San Benito River	Total
		Road	Creek 1	Creek 2	Fallon Road	Jarvis Lane	Creek	John Smith Road	Maranatha Road	Airline Highway	Ridgemark			
1994	232	136	515	0	0	550	209	0	0	0	0	85	158	**1,885**
1995	444	238	770	2	0	654	622	73	0	0	0	809	2,734	**6,345**
1996	0	494	989	832	67	235	708	531	197	134	25	21	6,097	**10,330**
1997	0	447	601	1,981	77	0	200	17	353	286	29	1,477	5,619	**11,087**
1998	0	132	109	403	0	0	0	65	0	158	74	518	1,084	**2,543**
1999	0	0	0	0	0	0	4	256	48	141	10	452	413	**1,322**
2000	1	0	0	6	0	0	3	236	21	240	12	285	938	**1,740**
2001	0	0	0	0	0	0	0	161	17	186	1	703	1,041	**2,110**
2002	0	0	0	2	0	0	1	78	2	143	0	426	470	**1,122**
2003	0	0	0	0	0	0	5	119	9	172	0	163	605	**1,074**
2004	0	0	0	0	0	0	52	83	0	0	0	1	882	**1,018**
2005	0	0	0	0	0	0	0	0	0	0	0	0	527	**527**
2006	0	0	0	0	0	0	7	156	0	0	0	1	451	**614**
2007	0	0	0	0	0	0	0	0	0	0	0	88	216	**304**
2008	0	0	0	0	0	0	0	0	0	0	0	0	6	**6**
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Table D-4. Percolation of Municipal Wastewater during Water Year 2015

	Pond Area[1] (acres)	Effluent Discharge (acre-feet)	Evaporation[2] (acre-feet)	Percolation (acre-feet)
Hollister - domestic*	92.9	2,082	266	1,816
Hollister - industrial*	39.0	456	112	344
Ridgemark Estates I & II	7.2	182	21	161
Tres Pinos[3]	1.8	26	5	21
Total	141	2,746	404	2,342

Notes:

1. Hollister pond areas are from Dickson and Kenneth D. Schmidt and Associates (1999) and include treatment ponds in addition to percolation ponds at the domestic wastewater treatment plant. Assumes 80% of total pond area in use at any time (Rose, pers. comm.). These areas should be updated as operations change.
2. Average evaporation less precip = 43 inches (56 in/yr evaporation (DWR Bulletin 73-79) less 13 in/yr precip (CIMIS)
3. Values for Tres Pinos were based on WY 2008 values, as current data was not available

The San Juan Bautista plant is not included because the unnamed tributary of San Juan Creek that receives its effluent usually gains flow along the affected reach and is on the southwest side of the San Andreas Fault. These conditions prevent the effluent from recharging the San Juan Subbasin.

Table D-5. Historical Percolation of Municipal Wastewater (AFY)

	Hollister Reclamation Plant - Domestic	Hollister - industrial	Ridgemark Estates I & II	Tres Pinos	TOTAL
1994	1,775	665	155	5	2,600
1995	1,935	610	180	10	2,735
1996	2,020	689	207	14	2,930
1997	1,965	909	201	17	3,092
1998	2,490	518	231	17	3,256
1999	1,693	1,476	156	12	3,337
2000	2,110	1,136	293	24	3,563
2001	1,742	1,078	303	24	3,147
2002	1,884	1,545	283	24	3,736
2003	2,009	1,432	279	24	3,744
2004	1,787	1,536	268	21	3,612
2005	1,891	1,323	227	26	3,468
2006	1,797	1,211	216	33	3,257
2007	1,740	1,228	139	19	3,126
2008	1,580	1,257	139	19	2,996
2009	1,976	428	172	19	2,594
2010	1,922	37	172	19	2,150
2011	1,807	466	183	19	2,476
2012	1,740	605	177	19	2,541
2013*	889	332	188	21	1,430
2014	1,552	86	179	21	1,838
2015	1,816	344	161	21	2,342

* Hollister WW data for 2013 updated with new data

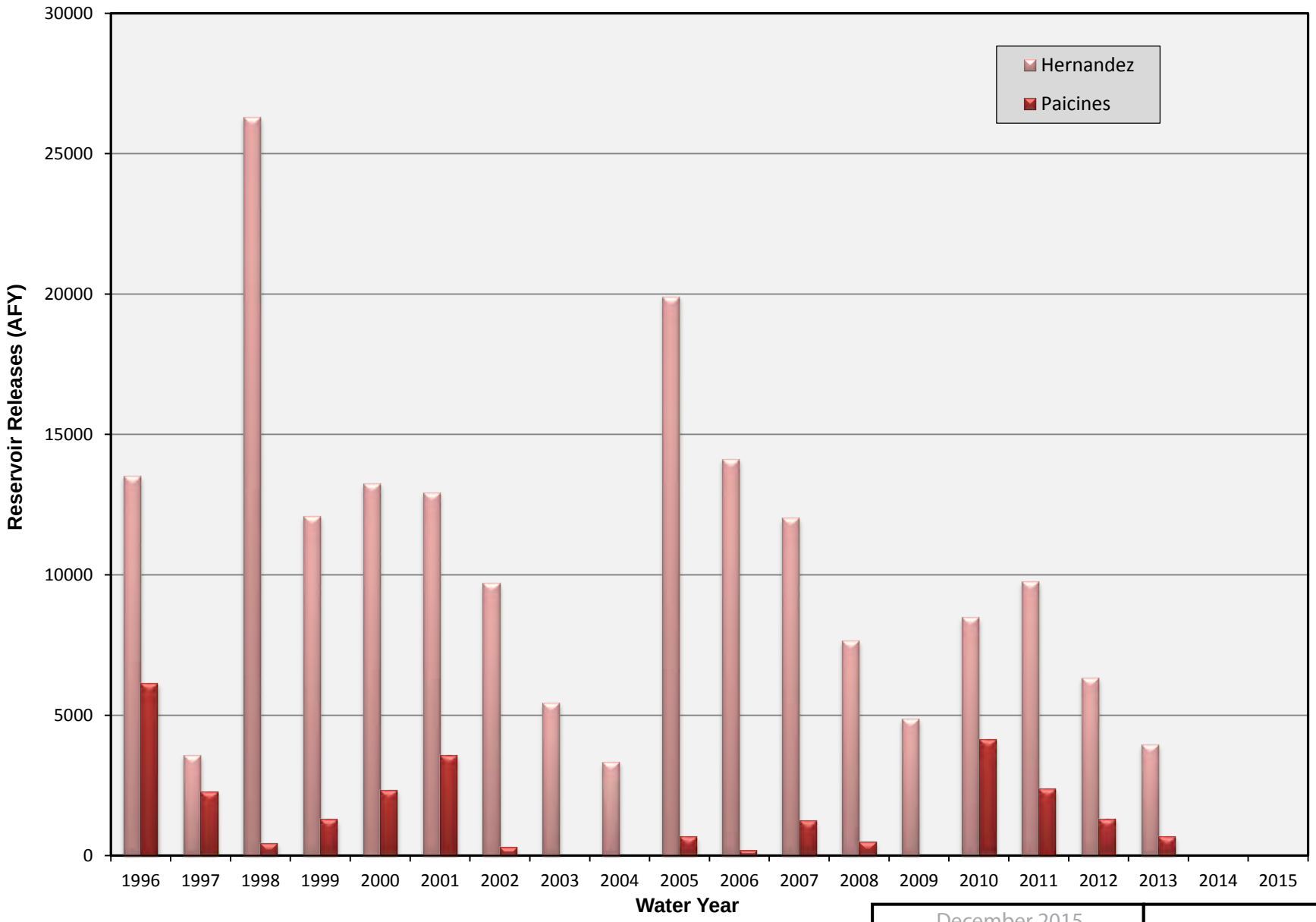

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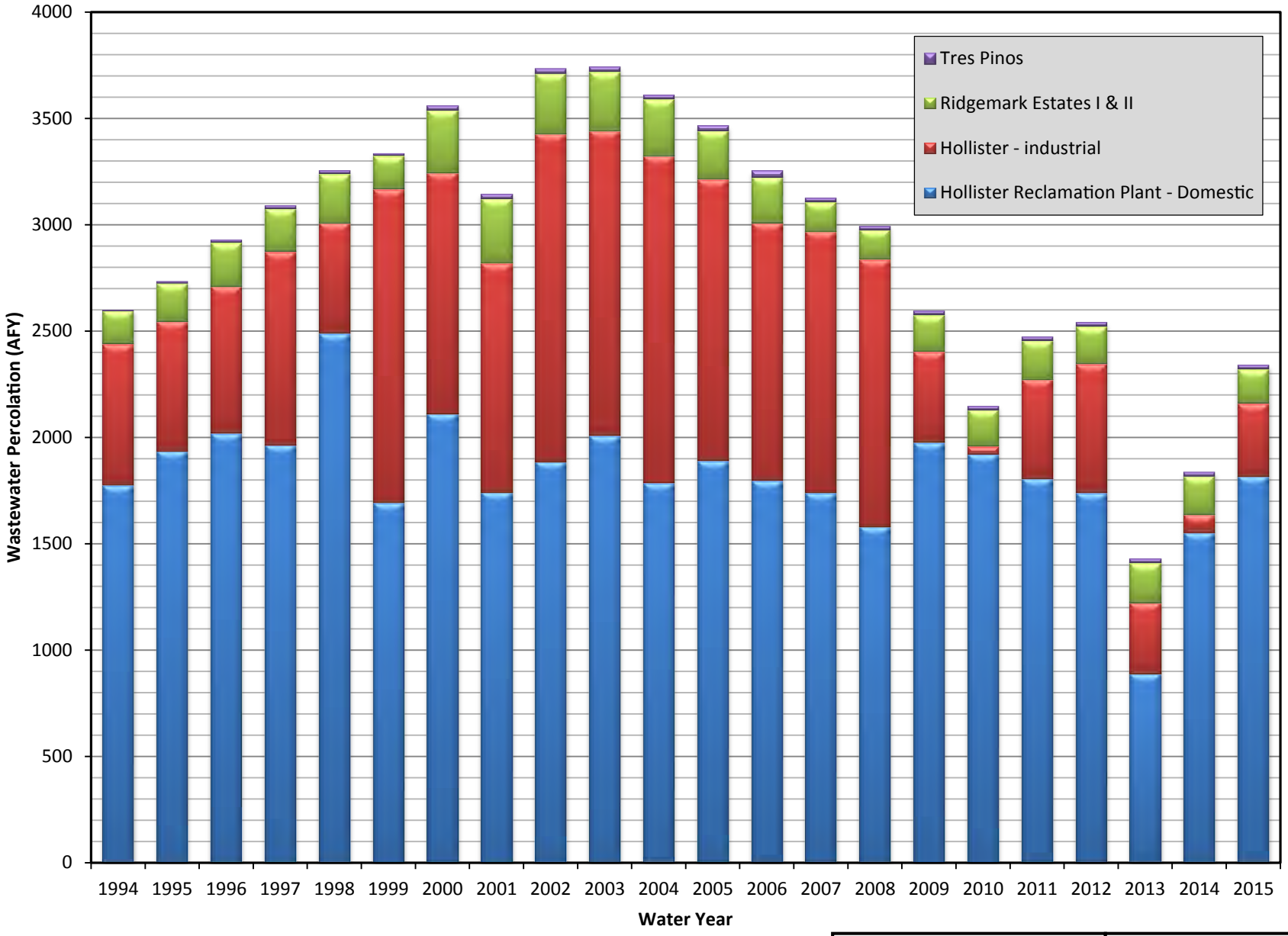
Figure D-1
Reservoir Releases for Percolation



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E WATER USE DATA

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	Municipal and Industrial (M&I) CVP				Agricultural CVP			
Water Year	Percent of Contract Allocation	Percent of Historic Average	Contract Amount Used (AF)	Contract Amount Used (%)	Percent of Contract Allocation	Percent of Contract and M&I Adjustment[1]	Contract Amount Used (AF)	Contract Amount Used (%)
	(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)		(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)	
2006	100%		3,152	38%	100%		19,840	56%
2007	100%		4,969	60%	40%		18,865	53%
2008	37%	75%	2,232	27%	40%	45%	10,514	30%
2009	29%	60%	1,978	24%	10%	11%	6,439	18%
2010	37%	75%	2,197	27%	45%	50%	10,061	28%
2011	100%		2,433	29%	80%		16,234	46%
2012	51%	75%	2,683	33%	40%	40%	17,267	49%
2013	47%	70%	2,652	32%	20%	22%	12,914	36%
2014	34%	50%	1,599	29%	0%	0%	7,545	21%
2015	25%	25%	1,810	22%	0%	0%	3,697	10%

Notes:

[1] If the M&I allocation is 75 percent or less, the difference between the M&I contract amount and M&I allocation is added to the agricultural contract amount. The agricultural percentage is multiplied by that sum to obtain the agricultural allocation.

Table E-2. Historical Water Use by Subbasin and Water Source (AFY)

Subbasin	Pacheco		Bolsa Southeast		San Juan		Hollister West		Hollister East		Tres Pinos		Total Zone 6		
Source	GW	CVP	GW	CVP	GW	CVP	GW	CVP	GW	CVP	GW	CVP	GW	CVP	RW
1993	2,251	3,210	3,474	533	9,278	4,300	7,213	90	3,744	7,275	5,658	224	31,618	15,633	-
1994	3,748	3,394	3,467	602	10,859	3,836	7,327	87	5,475	6,808	5,294	263	36,169	14,990	-
1995	2,756	3,474	2,855	720	9,328	4,554	7,092	460	3,428	6,647	4,475	275	29,935	16,130	-
1996	2,533	3,500	2,682	782	8,726	5,187	5,717	679	3,396	8,267	3,695	408	26,748	18,823	-
1997	2,209	4,205	2,755	997	9,587	6,191	7,602	907	3,534	8,284	4,620	466	30,307	21,048	-
1998	2,035	2,165	1,561	361	6,963	4,099	4,991	591	4,037	5,291	3,751	289	23,338	12,796	-
1999	2,553	3,219	2,453	433	9,312	5,990	7,013	726	3,701	7,279	4,199	391	29,231	18,038	-
2000	2,270	3,256	2,418	355	8,681	6,372	7,590	869	3,108	7,279	4,006	542	28,073	18,673	-
2001	1,848	3,443	2,126	411	7,977	7,232	7,377	685	2,213	7,010	3,599	621	25,140	19,402	-
2002	2,322	3,840	2,193	497	7,571	7,242	6,577	706	2,588	7,390	3,994	737	25,244	20,411	-
2003	2,425	3,277	2,175	493	7,434	7,127	6,222	720	1,897	9,329	2,805	788	22,958	21,734	-
2004	2,461	3,607	2,405	740	8,121	7,357	4,971	614	2,321	10,726	3,204	966	23,484	24,010	-
2005	1,320	3,106	1,849	514	6,608	6,245	5,084	680	2,586	9,198	2,378	642	19,825	20,384	-
2006	1,208	3,495	1,864	661	6,741	7,200	4,633	579	2,555	10,253	2,537	803	19,538	22,992	-
2007	1,034	3,832	2,005	572	7,658	6,160	5,118	553	3,867	10,194	2,908	804	22,590	22,115	-
2008	1,900	1,568	2,014	333	7,796	3,160	4,375	399	3,962	6,792	2,743	493	22,789	12,745	-
2009	3,370	1,257	2,082	179	11,956	1,605	4,186	19	4,733	4,697	2,871	447	29,199	8,204	-
2010	2,553	1,771	1,897	207	9,561	3,452	4,081	10	4,460	6,056	1,686	488	24,238	11,984	151
2011	1,992	2,420	2,781	229	4,987	5,623	3,940	394	1,947	9,575	2,454	427	18,102	18,667	183
2012	3,723	2,652	1,556	288	5,782	5,976	4,298	549	2,004	9,917	2,492	568	19,855	19,949	230
2013*	4,157	1,976	2,348	292	11,044	4,134	5,656	374	5,430	8,224	2,452	565	31,087	15,566	357
2014	3,303	1,020	2,157	32	10,018	1,984	7,227	233	4,872	5,490	3,014	384	30,592	9,144	262
2015	4,279	555	2,401	20	12,739	975	4,730	148	7,230	3,568	2,948	241	34,327	5,507	101
AVG 03-15	2,594	2,349	2,118	351	8,496	4,692	4,963	406	3,682	8,002	2,653	586	24,506	16,385	99

GW = groundwater, CVP = Central Valley Project, RW = recycled water

* Hollister RW data updated for 2013 based on new data

Table E-3. Recent Water Use by Subbasin and User Type, not including recycled water (AFY)

SUBBASIN	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Agriculture											
Bolsa SE	2,352	2,517	2,570	2,334	2,252	2,103	3,004	1,837	2,635	2,180	2,417
Hollister East	8,543	9,526	10,685	8,012	6,860	8,315	9,067	9,453	10,832	8,151	8,464
Hollister West	2,128	1,936	2,145	1,509	1,708	1,888	2,190	2,228	3,324	2,584	2,750
Pacheco	4,190	4,469	4,573	3,220	4,304	4,242	4,279	6,148	5,990	4,121	4,658
San Juan	11,496	12,622	12,185	9,581	12,397	11,960	10,009	10,964	14,376	11,183	13,123
Tres Pinos	800	1,004	954	655	670	640	471	641	652	514	1,513
TOTAL	29,509	32,074	33,112	25,310	28,192	29,148	29,020	30,980	37,810	28,734	32,926
M&I											
Bolsa SE	12	8	7	13	9	0	6	6	4	9	5
Hollister East	3,241	3,280	3,203	2,742	2,570	2,201	2,455	2,469	2,822	2,211	2,334
Hollister West	3,636	3,168	3,361	3,265	2,710	2,477	2,144	2,619	2,705	4,876	2,128
Pacheco	235	234	293	248	323	83	133	227	144	203	176
San Juan	1,356	1,320	1,640	1,375	1,164	1,053	601	793	803	820	590
Tres Pinos	2,220	2,336	2,748	2,581	2,648	3,048	2,410	2,710	2,365	2,884	1,676
TOTAL	10,700	10,345	11,252	10,225	9,424	8,862	7,749	8,825	8,843	11,002	6,909

Table E-4. Historical Water Use by User Type (AFY)

WY	Agricultural	Municipal, and Industrial	Total	% Ag
1988	45,366	5,152	50,518	90%
1989	32,387	6,047	38,434	84%
1990	49,663	5,725	55,388	90%
1991	46,640	7,631	54,271	86%
1992	32,210	6,912	39,122	82%
1993	38,878	5,066	43,944	88%
1994	41,854	7,186	49,040	85%
1995	36,399	8,272	44,671	81%
1996	39,575	8,338	47,913	83%
1997	41,482	11,117	52,599	79%
1998	27,526	8,650	36,176	76%
1999	37,203	10,110	47,313	79%
2000	36,062	10,811	46,873	77%
2001	34,035	10,687	44,722	76%
2002	34,354	11,347	45,701	75%
2003	33,533	11,206	44,739	75%
2004	35,597	11,944	47,541	75%
2005	29,509	10,700	40,209	73%
2006	32,074	10,345	42,419	76%
2007	33,112	11,252	44,364	75%
2008	25,310	10,225	35,535	71%
2009	28,192	9,424	37,616	75%
2010	29,148	8,862	38,010	77%
2011	29,020	7,749	36,769	79%
2012	31,270	8,825	40,095	78%
2013	37,810	8,843	46,653	81%
2014	28,734	11,226	39,960	72%
2015	32,926	7,010	39,935	82%
AVERAGE	**34,995**	**8,952**	**43,947**	**79%**

Table E-5. Municipal Water Use by Purveyor for Water Year 2015(AF)

	WY 2015	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Groundwater													
Sunnyslope CWD	**1,348**	188	108	114	48	39	65	114	118	122	137	154	142
City of Hollister	**1,960**	310	222	110	96	70	124	138	141	169	194	224	162
City of Hollister - Cienega Wells	**114**	11	9	10	10	9	9	10	9	9	9	9	9
San Juan Bautista	**225**	22	16	13	12	15	18	19	18	19	26	23	24
Tres Pinos CWD	**49**	4	4	3	3	3	2	3	4	5	5	4	8
Groundwater Subtotal	**3,696**	**535**	**358**	**251**	**168**	**135**	**220**	**283**	**291**	**324**	**372**	**415**	**344**
CVP Imported Water													
Lessalt Treatment Plant	**1,364**	0	0	36	144	160	179	141	157	139	144	143	121
Imported Water Subtotal	**1,364**	**-**	**-**	**36**	**144**	**160**	**179**	**141**	**157**	**139**	**144**	**143**	**121**
Municipal Total													
Municipal Water Supply Total	**5,060**	**535**	**358**	**287**	**312**	**295**	**399**	**425**	**448**	**462**	**515**	**558**	**465**

Table E-6. Historical Municipal Water Use by Purveyor (AFY)

WY	Sunnyslope CWD - GW	City of Hollister - GW	City of Hollister - Cienega Wells[1]	San Juan Bautista	Tres Pinos CWD	Lessalt Treatment Plant	Undivided Total	TOTAL
1988						0	5,152	**5,152**
1989						0	6,047	**6,047**
1990						0	5,725	**5,725**
1991						0	7,631	**7,631**
1992						0	6,912	**6,912**
1993						0	5,066	**5,066**
1994						0	7,186	**7,186**
1995	2,167	2,446				0		**4,613**
1996	2,139	3,386				0		**5,525**
1997	2,638	3,848				0		**6,486**
1998	2,357	3,441				0		**5,798**
1999	2,820	3,558				0		**6,378**
2000	3,214	4,021				0		**7,235**
2001	3,290	3,851				0		**7,141**
2002	3,256	4,120				21		**7,398**
2003	2,053	2,754				2,494		**7,302**
2004	2,426	2,828				2,101		**7,356**
2005	1,959	3,147	123	247	49	1,843		**7,368**
2006	1,907	2,801	123	150	49	1,900		**6,930**
2007	2,413	2,758	123	47	49	1,719		**7,108**
2008	2,294	2,746	123	417	47	1,323		**6,949**
2009	2,251	2,503	123	373	47	1,212		**6,509**
2010	1,861	2,194	108	308	47	1,344		**5,861**
2011	2,225	1,651	80	292	47	1,593		**5,887**
2012	2,360	1,761	130	267	45	1,657		**6,219**
2013	1,655	2,655	120	281	46	1,648		**6,405**
2014	2,134	2,646	114	285	49	979		**6,207**
2015	1,348	1,960	114	225	49	1,364		**5,060**

1. Data from Hollister Cienega Wells for 2005-2008 was estimated to be the same as WY 2009
Cells with no data indicate that the information is unavailable, while years with no use are shown explicitly as 0's.

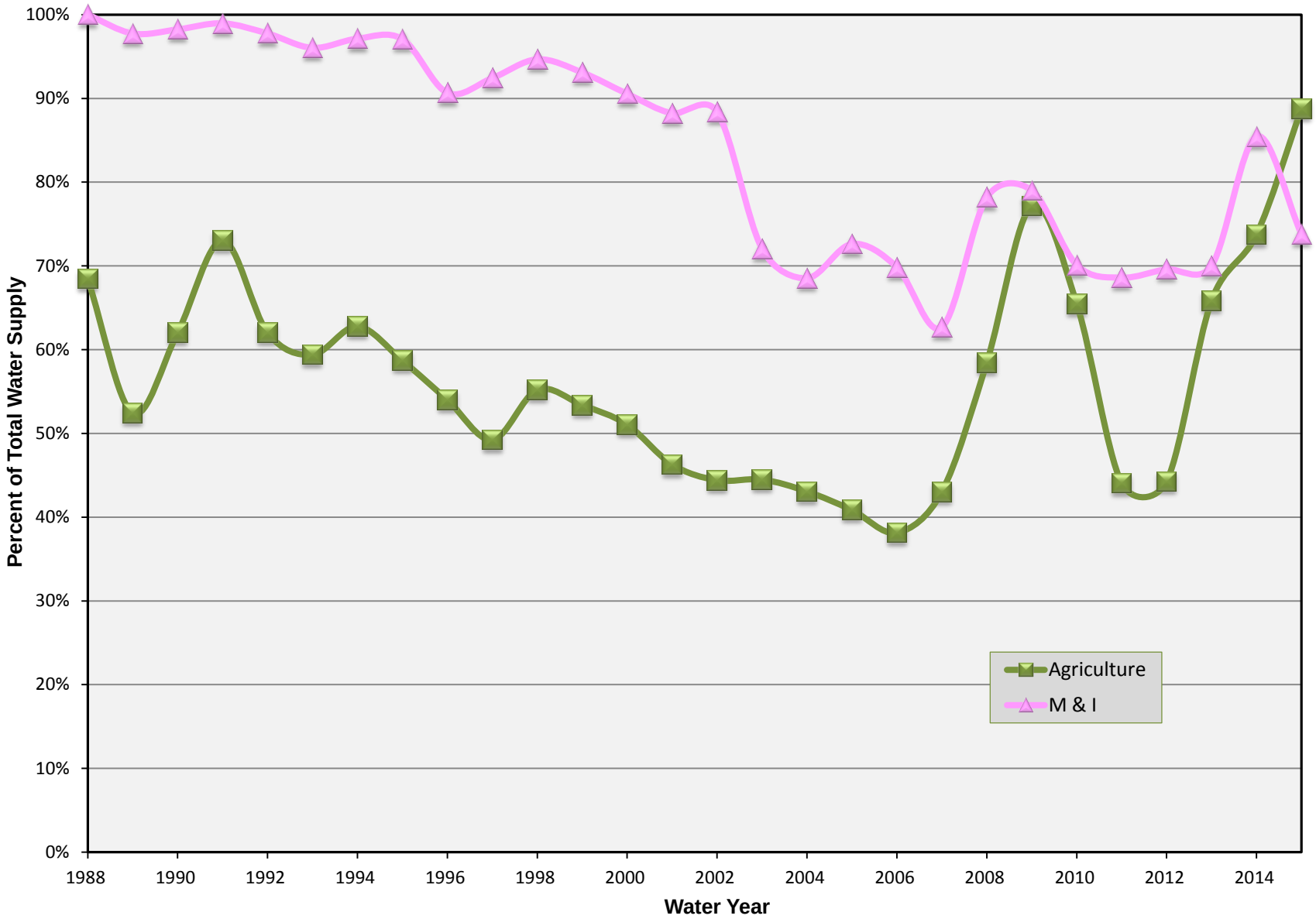

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Figure E-1
Groundwater Percentage of Total Water Use

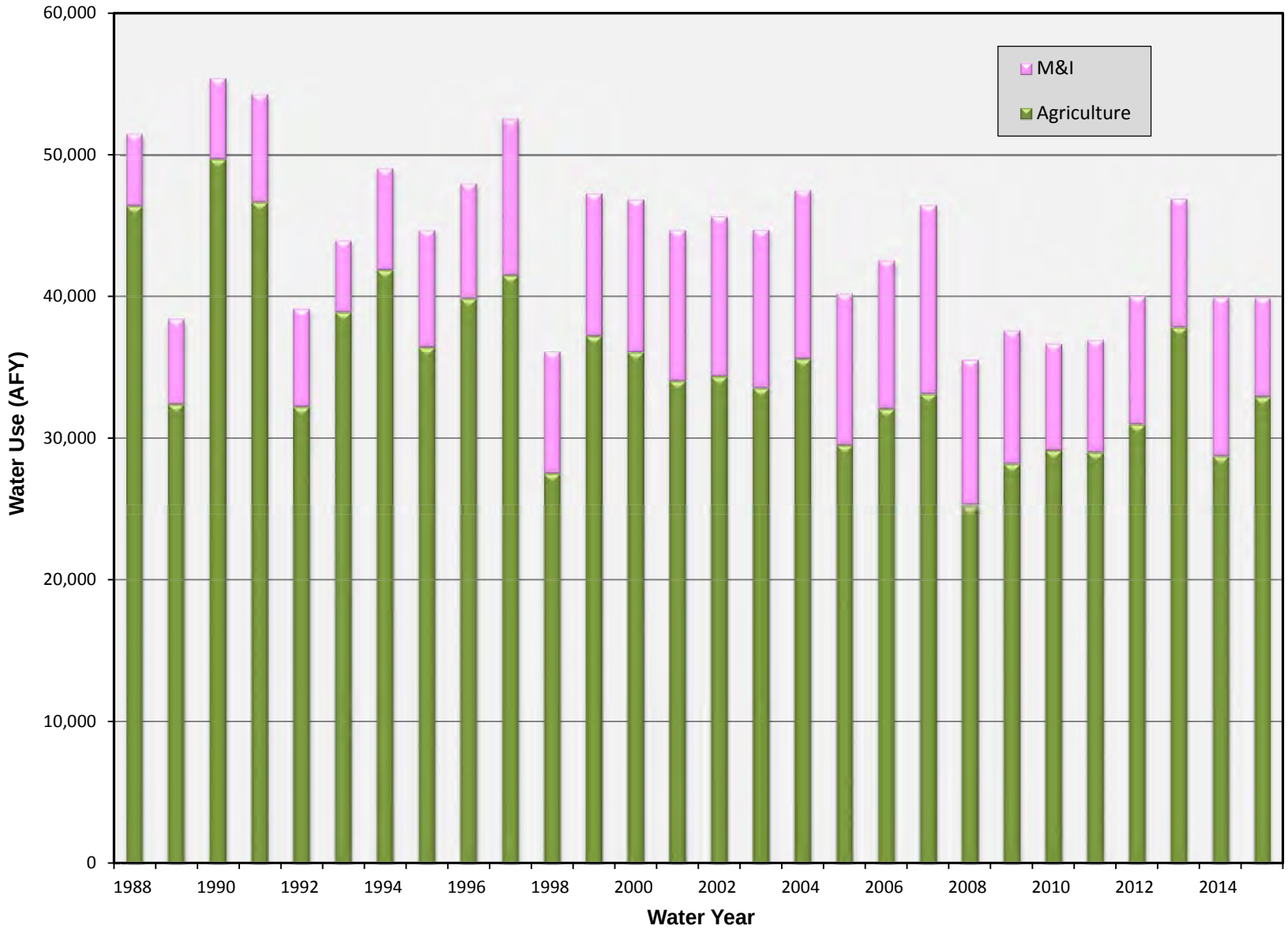

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Figure E-2
Water Use in Zone 6 by User Category

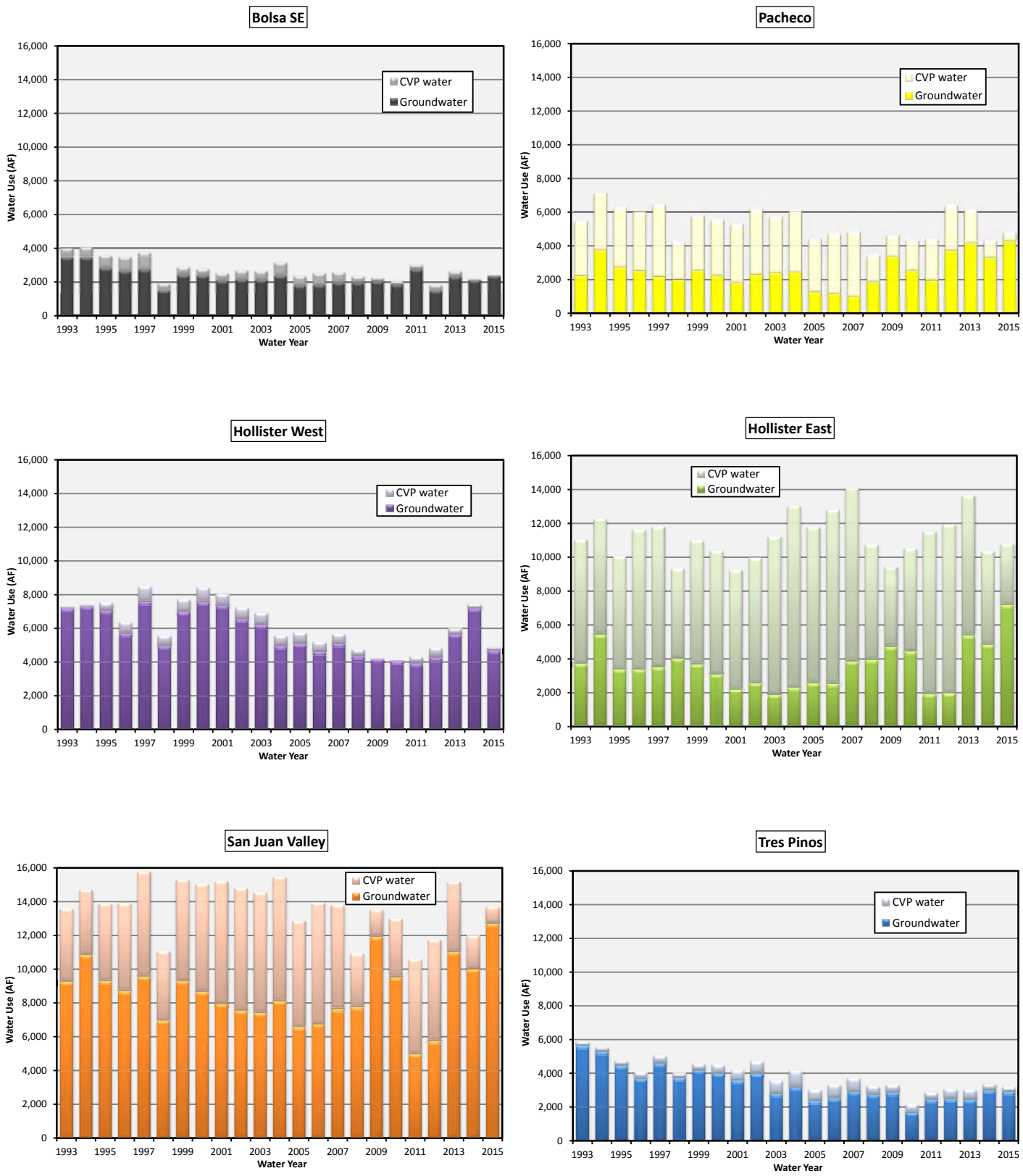

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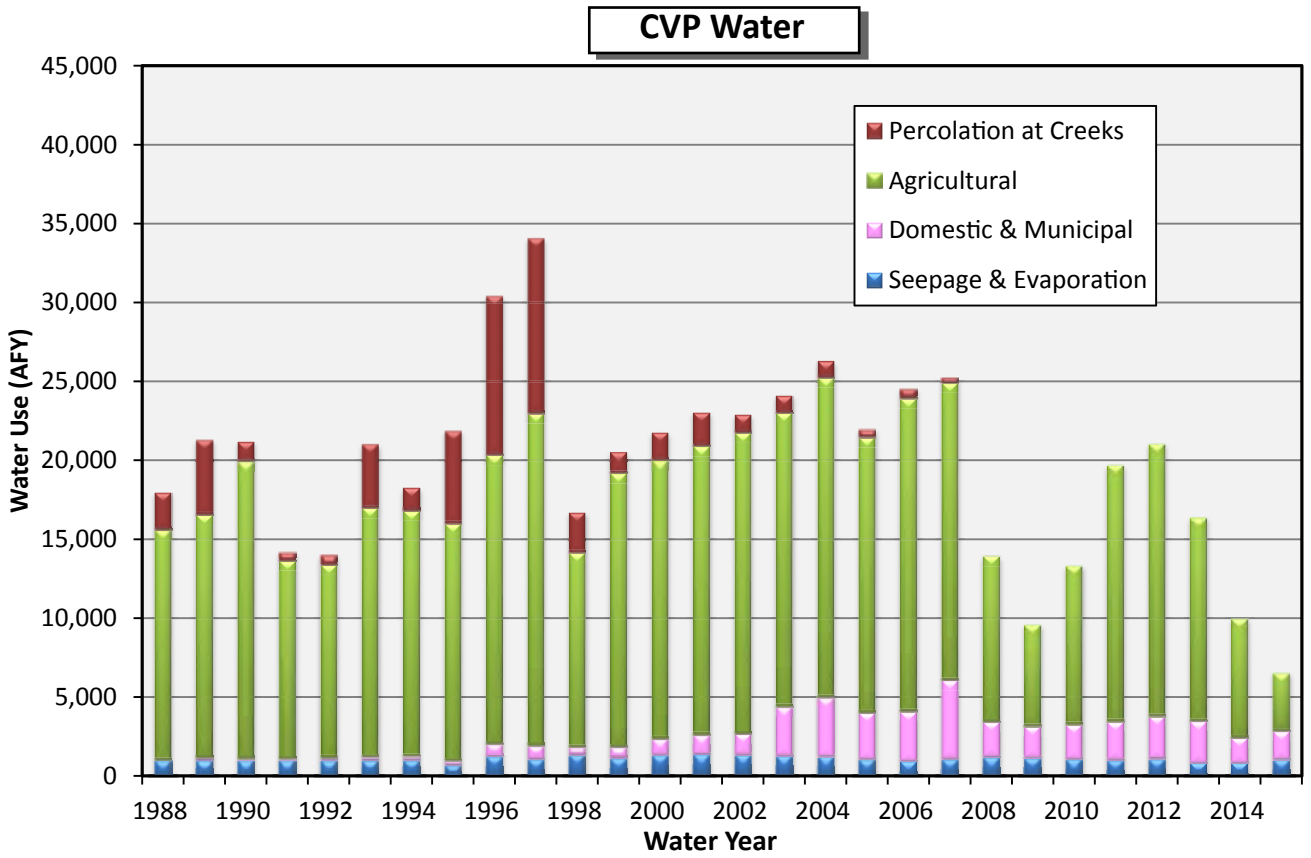
Figure E-3
Total Subbasin Water Use by Water Type



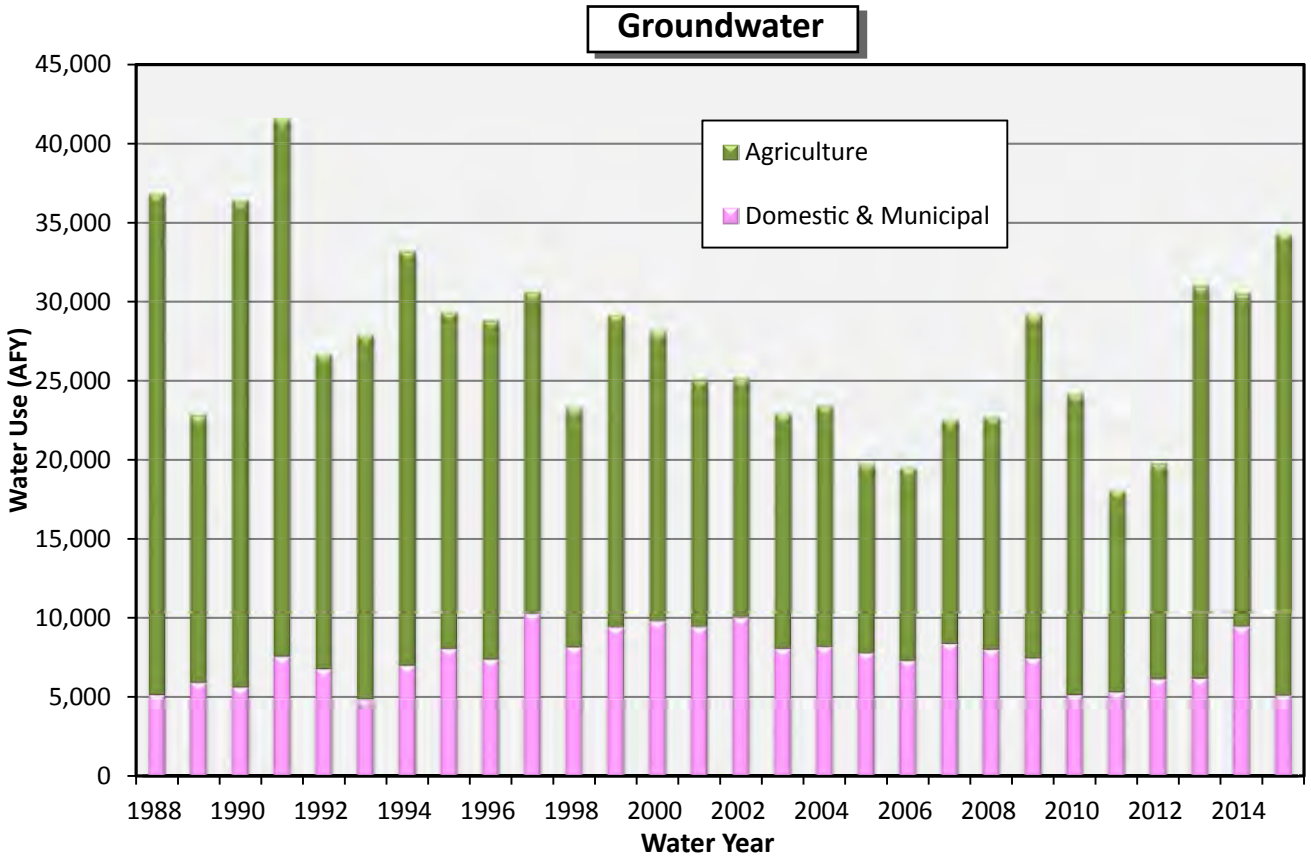


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Figure E-4
Annual Total of CVP and Groundwater by Use

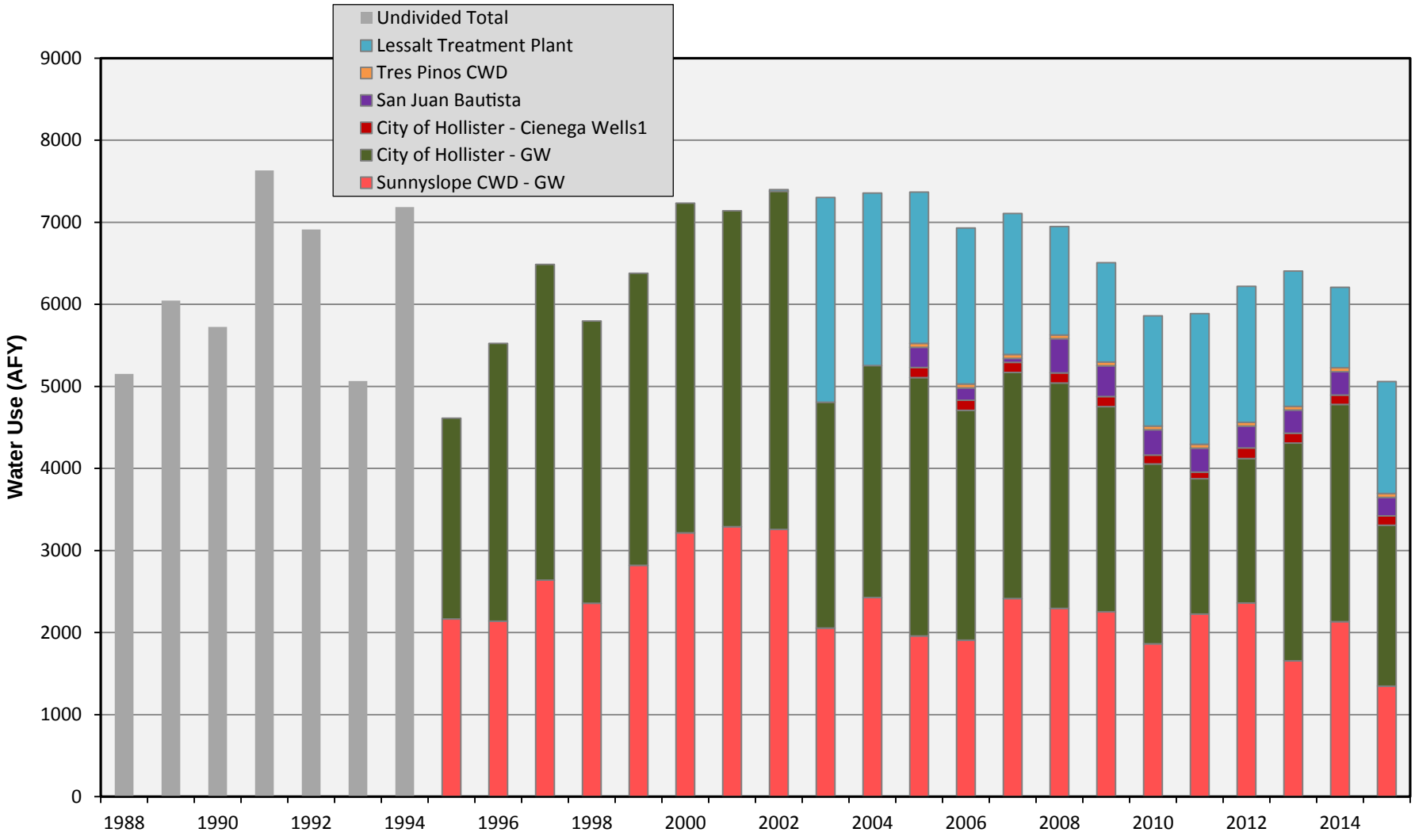

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Figure E-5
Municipal Water Use by Purveyor

F RATES AND CHARGES

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Table F-2. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

Table F-3. 2016 Recommended Groundwater Revenue Requirement/Charges (USBR Water Year 2016-2017)

Table F-1. Historical and Current San Benito County Water District CVP (Blue Valve) Water Rates (dollars/af)

USBR Water Year	Standby & Availability Charge (dollars/acre)	Water Charge		Power Charge					Groundwater Charge (dollars/af)		
		Agricultural	Municipal & Industrial	Distribution Subsystem					Agricultural	Municipal & Industrial	
				2	6H	9L	9H	Others			
1987	$8.00	$34.00	n.c.						n.i.	n.i.	
1988	$2.00	$34.00	n.c.						n.i.	n.i.	
1991	$4.00	$38.00	$110.00						$6.25	$22.00	
1992	$4.00	$45.00	$120.00						$2.00	$10.00	
1994	$4.50	$77.61	$168.92						$1.00	$5.00	
1995	$4.50	$77.61	$168.92						$1.00	$15.75	First 100 af
										$36.70	Next 500 af
										$54.60	Over 600 af
1996	$6.00	$75.00	$150.00						$1.50	$33.00	
1997	$6.00	$75.00	$157.00						$1.50	$33.00	
1998	$6.00	$75.00	$155.00						$1.50	$33.00	
2000	$6.00	$75.00	$155.00						$1.50	$11.50	
2001	$6.00	$75.00	$155.00						$1.50	$25.00	
2004	$6.00	$75.00	$150.00	$24.30	$46.75	$25.05	$53.70	$15.25	$1.50	$10.00	
2005	$6.00	$80.00	$150.00	$26.15	$49.40	$35.00	$66.90	$17.10	$1.50	$21.50	
2006	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50	
2007	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50	
2008	$6.00	$100.00	$170.00	$17.25	$19.40	$32.60	$62.75	$14.85	$1.50	$21.50	
2009	$6.00	$115.00	$180.00	$17.50	$20.25	$42.55	$74.85	$16.30	$2.50	$22.50	
2010	$6.00	$135.00	$200.00	$22.00	$27.30	$49.75	$84.35	$21.75	$2.50	$22.50	
2011	$6.00	$155.00	$220.00	$22.70	$28.15	$51.25	$86.90	$22.40	$2.50	$22.50	
2012	$6.00	$170.00	$235.00	$23.35	$29.00	$52.80	$89.50	$23.10	$2.50	$22.50	
2013	$6.00	$170.00	$235.00	$40.30	$29.25	$43.05	$91.55	$22.40	$3.25	$23.25	
2014	$6.00	$170.00	$238.00	$41.55	$30.15	$44.35	$94.30	$23.10	$3.60	$23.25	
2015	$6.00	$179.00	$247.00	$42.75	$31.05	$45.70	$97.15	$23.80	$3.95	$23.25	

Notes:

af = acre-feet.
n.c. = no classification.
n.i. = not implemented
All rates effective March 1 through following February.

Table F-2. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

	Irrigation[1]						Municipal & Industrial					
User Category and Cost Item	Cost of service (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]	Cost of service[2] (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]
1994	$71.68	$6.20	n.a.		$77.88	$17.21	$165.67	$12.40	n.a.		$178.07	$85.86
1995	$66.47	$6.35	n.a.		$72.82	$17.21	$132.90	$12.69	n.a.		$145.59	$85.86
1996	$65.63	$6.53	n.a.		$72.16	$27.46	$127.40	$13.06	n.a.		$140.46	$85.86
1997	$69.57	$6.70	n.a.		$76.27	$27.46	$143.27	$13.39	n.a.		$156.66	$85.86
1998	$61.58	$6.88	$5.00		$73.46	$27.46	$130.88	$13.76	$5.00		$149.64	$85.86
1999	$60.30	$6.98	$2.73		$70.01	$27.46	$127.91	$13.96	$2.73		$144.60	$85.86
2000	$64.24	$7.10	$6.43		$77.77	$27.46	$129.59	$14.20	$6.43		$150.22	$85.86
2001	$69.50	$7.28	$2.65		$79.43	$27.46	$129.40	$14.56	$4.15		$148.11	$85.86
2002	$68.71	$7.54	$6.61		$82.86	$24.30	$130.32	$15.08	$6.61		$152.01	$79.13
2003	$72.20	$7.69	$5.46		$85.35	$24.30	$129.07	$15.38	$5.46		$149.91	$79.13
2004	$74.52	$7.82	$6.61		$88.95	$24.30	$134.86	$15.64	$6.61		$157.11	$79.13
2005	$77.10	$7.93	$7.99		$93.02	$24.30	$132.01	$15.87	$7.99		$155.87	$79.13
2006	$91.13	$8.24	$9.31		$108.68	$30.93	$214.41	$16.49	$9.31		$240.21	$77.12
2007	$93.53	$8.58	$9.99	$0.11	$112.21	$30.93	$215.32	$17.15	$9.99	$0.11	$242.46	$80.08
2008[6]	$28.12	$8.79	$10.95	$0.07	$47.93	$30.93	$33.34	$17.57	$10.95	$0.07	$61.68	$33.34
2009	$30.20	$9.06	$11.49	$0.07	$50.82	$30.20	$32.77	$18.12	$11.49	$0.07	$62.45	$32.77
2010	$33.27	$9.11	$11.91	$0.11	$54.40	$33.27	$36.11	$18.23	$11.91	$0.11	$66.36	$36.11
2011	$38.92	$9.29	$9.51	$0.05	$57.77	$38.92	$42.58	$18.59	$9.51	$0.05	$70.73	$42.58
2012	$39.71	$9.39	$15.20	$0.05	$64.35	$39.71	$37.95	$18.78	$15.20	$0.05	$71.98	$37.95
2013	$40.39	$9.79	$17.29	$0.05	$67.52	$39.91	$38.71	$19.58	$17.29	$0.05	$75.63	$40.92
2014	$46.87	$9.99	$28.81	$0.23	$85.90	$46.87	$29.70	$19.98	$28.81	$0.23	$78.72	$29.70
2015	$53.82	$10.07	$30.66	$0.23	$94.78	$53.82	$34.74	$20.14	$30.66	$0.23	$85.77	$34.74

Notes:

(1) Total USBR rate given for non-full cost users only, as they represent the majority of water users.

(2) Cost-of-service for agricultural and municipal and industrial users includes a capital repayment rate and an operation and maintenance (O&M) rate. For municipal and industrial customers, cost-of-service also includes a deficit charge, which includes interest on unpaid O&M and interest on capital and on unpaid deficit.

(3) Restoration fund charges apply October 1 through September 30.

(4) Beginning in 1998, the San Luis-Delta Mendota Water Authority instituted this charge to "self-fund" costs associated with maintaining the Delta-Mendota Canal and certain other facilities, which were formerly funded directly by the Bureau of Reclamation. SLDMWA issues preliminary rates in December for the upcoming contract year (March-February). These rates are used for rate-setting purposes; actual rates may vary.

(5) The contract rate is the minimum rate CVP contractors are allowed to pay. To the extent that the contract rate does not cover interest plus actual operation and maintenance costs, a contractor deficit is accumulated that is charged interest at the current-year treasury borrowing rate.

(6) Per the amendatory contract with the USBR "out of basin" capital costs that were previously included in the cost of service are now under a separate repayment contract.

Table F-3. 2016 Recommended Groundwater Revenue Requirement/Charges

REVENUE REQUIREMENTS					Rates [2]	
	Component	Rate ($/AF)	Quantity[1] (af)	Amount	Ag	M & I
Source of Supply						
Ag	Source of Supply Costs	$9.42	18,544	$ 174,677	$ 9.42	
M&I	Source of Supply Costs	$28.26	6,246	$ 176,502		$ 28.26
Percolation Costs						
Ag	CVP Water Rate[3]	$297.49	-	$ -	$ 3.49	
M&I	CVP Water Rate[3]	$407.68	-	$ -		$ 7.75
Ag	Power Charge for Percolation	$0.00	-	0	$ -	
M&I	Power Charge for Percolation	$0.00	-	0		$ -
Calculated Total					$ 9.42	$ 28.26
Previous Groundwater Charge (per acre foot)					$ 3.95	$ 23.25
CURRENT AND RECOMMENDED CHARGES (per acre foot)					**$ 4.95**	**$ 24.25**

1 Assumed Volumes
Percolation (based on average of last 3 years of recharge
Groundwater Usage (based on average of past 3 years)
2 Rates=Revenue Requirement/projected usage
3 CVP water rate basis for 2014-2015 water year

Note: Section 70-7.8 (a) of the District Act states that the agricultural rate shall not exceed one-third of the rates for all water other than agricultural water.

G SUSTAINABILITY

List of Attachments

from Association of California Water Agencies (ACWA)

- Drought Recovery Infographic

November 2015

Association of
California Water Agencies
Since 1910
Leadership • Advocacy • Information • Service

WILL EL NIÑO END CALIFORNIA'S DROUGHT?

The stage is set for a strong El Niño event this winter, but experts say it is unlikely to erase California's four-year drought. While there is no single factor that will determine when the drought ends, here is a high-level look at factors the National Oceanic and Atmospheric Administration and the California Department of Water Resources will be watching for signs of improvement.

KEY CALIFORNIA DROUGHT RECOVERY FACTORS

SNOWPACK

California relies on gradual snowmelt from the Sierra Nevada to provide a major portion of its water supply. To make a dent in the drought, this winter's snowpack would need to return to at least average or above — about 39 inches of snow water content on April 1.

TEMPERATURES

Storms must be cold enough to support significant snowpack in the Sierra. The average winter minimum temperature in the Sierra would need to drop by 6 degrees from last year's average — from 32.1 degrees to 26 degrees. The above-normal temperatures currently predicted for Northern California are not a good sign.

RAINFALL

Based on past drought-busting years, precipitation would need to be about 120% of average — about 60 inches — in key Northern California watersheds.

RESERVOIRS

Four years of drought have reduced the state's key reservoirs to about a third of their capacity or less. Above-normal rain and runoff in Northern California would be needed for storage levels to recover this winter.

GROUNDWATER

Groundwater levels are down by as much as 100 feet in some areas. Experts say recovery will be a multi-year process that depends on how basins are recharged and how much groundwater continues to be pumped.

WATER FOR FARMS AND COMMUNITIES

Surface water deliveries for farms were reduced by 8.7 million acre-feet in 2015. Urban areas also have seen reduced deliveries and have been subject to mandatory conservation. Restored water deliveries and lifting of emergency conservation measures will be a sign of drought recovery.

KEY UNKNOWNS

STRENGTH AND LOCATION OF STORMS

NOAA's latest outlook does not project where and when storms may occur. Heavy rain and even flooding in Southern California — without snow in Northern California — will not be enough to end the drought.

MUDSLIDES AND DEBRIS

Torrential rainfall could trigger flooding, mudslides and debris flows — even during drought. Areas affected by recent wildfires are especially susceptible to mud and debris flow, with potentially big impacts on water supply sources.

NEXT YEAR

Even if El Niño brings heavy rain and snowfall this winter, drought conditions may return next year. California may be facing a "new normal" of extreme droughts and floods due to climate change.

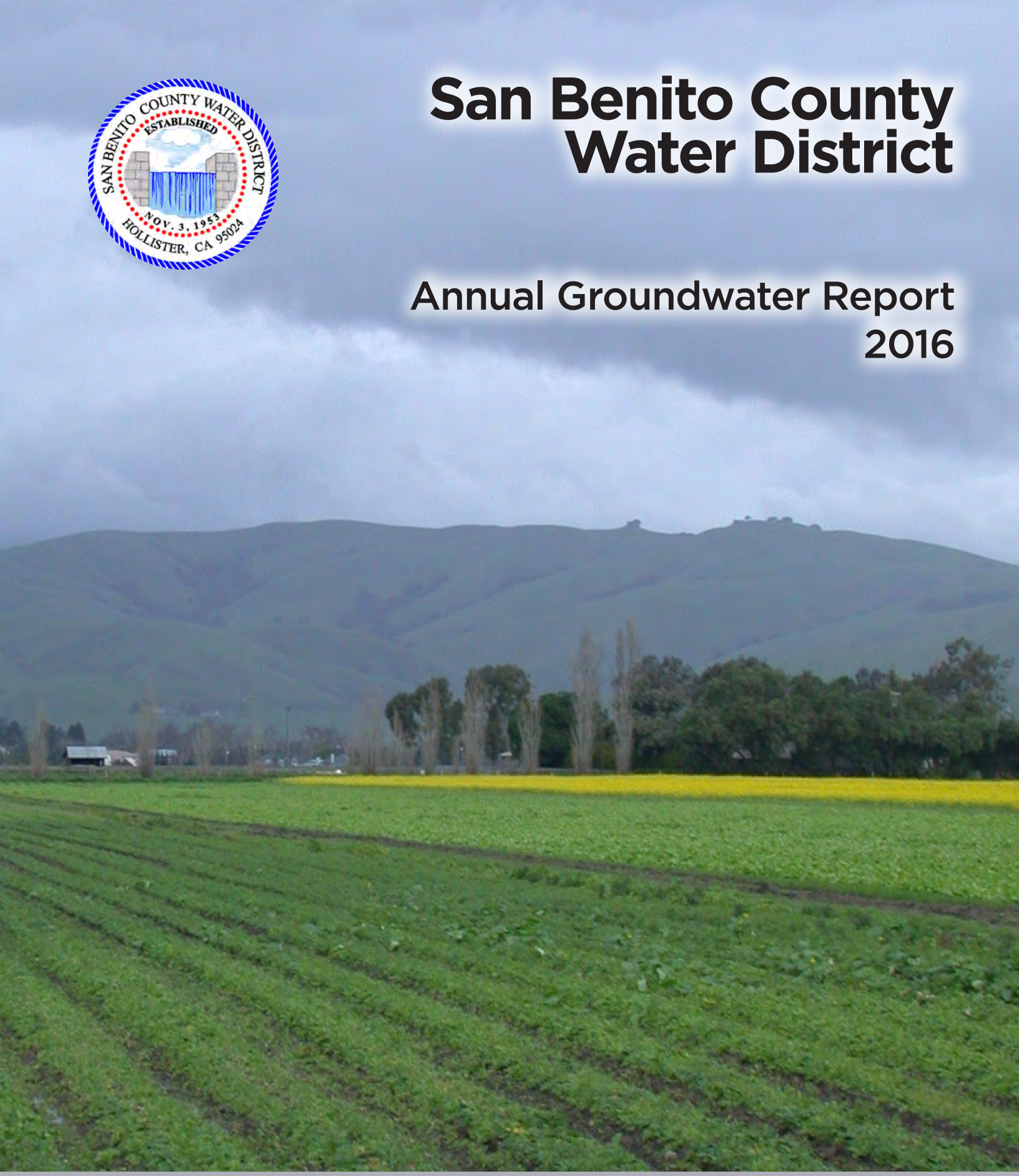
2016

H LIST OF ACRONYMS

AF	acre-foot
AFY	acre-foot per year
ag	agriculture
CASGEM	California Statewide Groundwater Elevation Monitoring
CDHSPH	California Department of Public Health
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
COC	Constituent Of Concern
CVP	Central Valley Project
District or SBCWD	San Benito County Water District
DWR	California Department of Water Resources
DWTP	Domestic Wastewater Treatment Plant
ET	evapotranspiration
ft	feet
gpd	gallons per day
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
gw	groundwater
IRWMP	Integrated Regional Water Management Plan
ITRC	Irrigation Training and Research Center, California Polytechnic State University
IWTP	Industrial Wastewater Treatment Plant
M&I	Municipal And Industrial
MGD	million gallons per day
OCR	Optical Character Recognition
pdf	Adobe Acrobat Portable Document Format
PVWMA	Pajaro Valley Water Management Agency
RW	recycled water
RWQCB	Regional Water Quality Control Board
SCVWD	Santa Clara Valley Water District
SEIR	Supplemental Environmental Impact Report
SGMA	Sustainable Groundwater Management Act
SLDMWA	San Luis & Delta-Mendota Water Authority
SSCWD	Sunnyslope County Water District
USBR	U.S. Bureau of Reclamation
UWMP	Urban Water Management Plan
WRA	Water Resources Association of San Benito County
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WY	water year

San Benito County Water District

Annual Groundwater Report 2016



TODD GROUNDWATER

ANNUAL GROUNDWATER REPORT

WATER YEAR 2016

DECEMBER 2016

TODD GROUNDWATER

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ES EXECUTIVE SUMMARY

PLANNING A SUSTAINABLE FUTURE

This Annual Groundwater Report for San Benito County Water District (District) describes groundwater conditions in the San Benito County portion of the Gilroy-Hollister basin. It documents water supply sources and uses, groundwater levels and storage, and District management activities for water year 2016.

Water year 2016 may be the beginning of a slow recovery from the long-term drought that the District and state has experienced; precipitation was above normal for the first time since 2011. The allocation for imported water increased to 5 percent for agriculture; this represents the first agricultural allocation since 2013. Total water use remained similar to water year 2015 and groundwater remains a large portion of total supply at 83 percent. Water levels remained above historical lows but decreased slightly from last year. Parts of the basin (like San Juan Subbasin) that relied on groundwater throughout the drought still show relatively low groundwater levels. While groundwater level recovery will require increased Central Valley Project (CVP) allocations and perhaps years for full recovery, such low levels are expected with conjunctive use of imported surface water and groundwater resources and can be consistent with long-term sustainability.

The special section of this year's report addresses water quality. The District's water quality database was updated to include recent water quality data for drinking water wells, District monitoring wells, and regulated facilities. Water quality trends and exceedances of water quality goals since the last update in 2013 are presented in this report. Overall, water quality remains stable in the basin but stricter regulatory limits for constituents such as Chromium VI have required municipal providers to take action.

Fewer wells were monitored in 2016 for both the water level and water quality networks, and the decreasing coverage and consistency of monitoring data have ramifications for tracking groundwater conditions. While recognizing that future planning (in accordance with the Sustainable Groundwater Management Act, SGMA) will likely entail revision of the monitoring program, it is recommended that the network of monitored wells (groundwater elevation and quality) be stabilized in terms of spatial distribution and number of wells and timing of measurements.

The District is continuing with long term water resource management planning, including compliance with SGMA. SGMA evolved significantly in 2016, most notably with completion of regulations for preparing a Groundwater Sustainability Plan (GSP). By June 30, 2017, establishment of a Groundwater Sustainability Agency (GSA) for local basins[1] is required; the District is considering the next steps for forming a GSA and for planning and funding a GSP.

[1] Except when specified, "basin" is used generally to include basins and subbasins.

1 INTRODUCTION

The San Benito County Water District (District) was formed by a special act of the State with responsibility and authority to manage groundwater. The special act allows the Board of Directors to require an annual groundwater report and, as documented in Appendix A, specifies the minimum content of the report should the District choose to prepare one. The District, at its discretion, has also directed that specific Annual Reports include focused discussion of selected topics; this year, the focused topic is an update on water quality conditions.

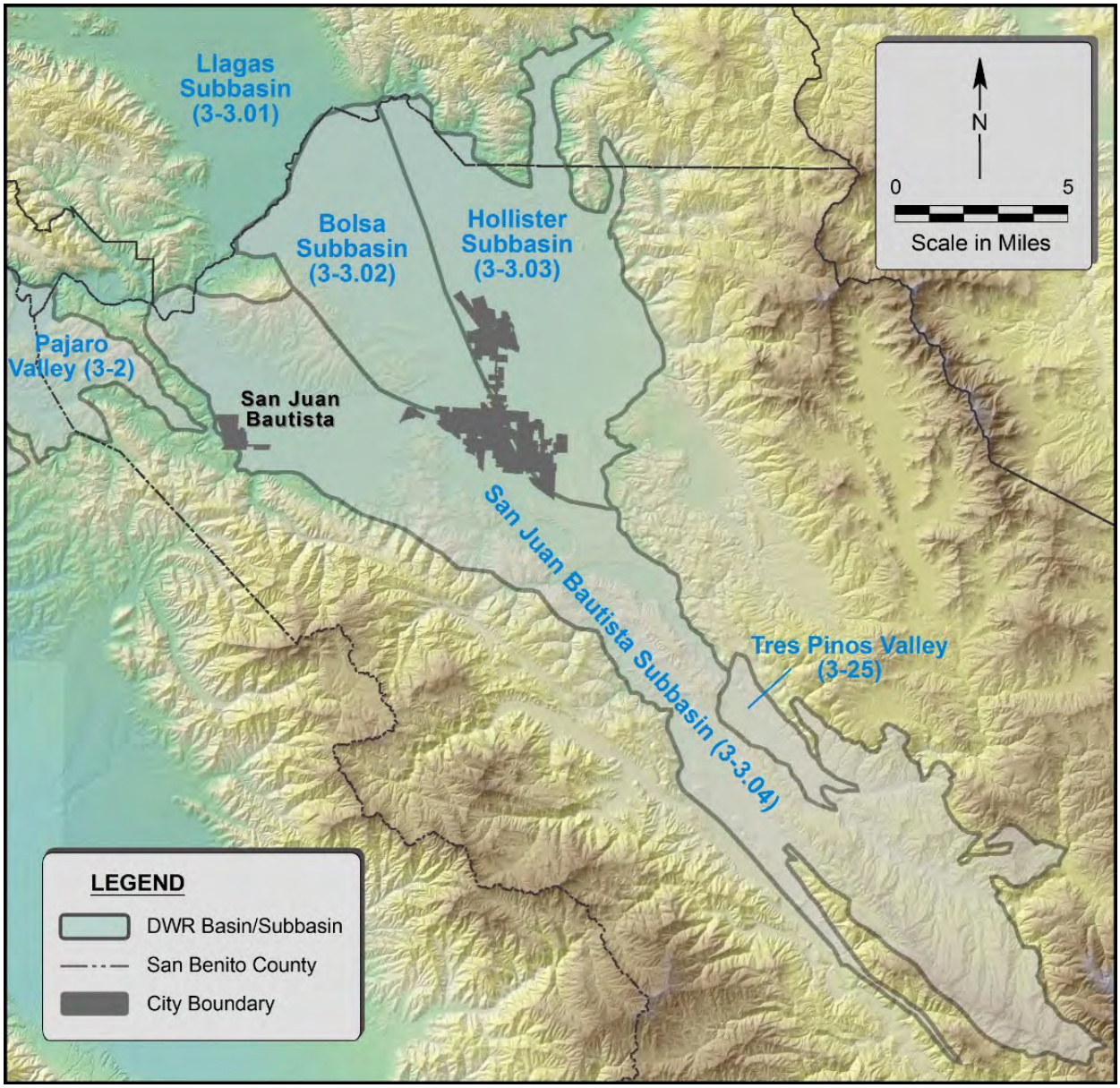
This Annual Report, prepared at the request of the District, documents water supply sources and use, groundwater levels and storage, and District management activities from October 2015 through September 2016. It is intended to present an overview of the state of the groundwater basin. It also conveys considerable information, including tables and figures, which are provided largely in Appendices B through E. Appendix F provides information on water rates and charges, Appendix G provides information on water quality, and Appendix H is a list of acronyms.

Throughout this report, water volumes and changes in storage are shown to the nearest acre-foot (AF). These values are accurate to one to three significant digits (depending on the measurement). All digits are retained in the text to maintain as much accuracy as possible during subsequent calculations, but results should be rounded appropriately.

Acknowledgments

This report was prepared by Iris Priestaf, PhD, Maureen Reilly, PE, Chad Taylor, PG, CHg, and Gus Yates, PG, CHg of Todd Groundwater. We appreciate the assistance of San Benito County Water District staff, particularly Jeff Cattaneo, Garrett Haertel, and David Macdonald.

Figure 1. DWR Defined Basins and Subbasins.



Geographic Areas

This report focuses on the northern San Benito County portion of the Gilroy-Hollister groundwater basin (**Figure 1**), which extends into southern Santa Clara County. The San Benito part of the basin encompasses the City of Hollister, City of San Juan Bautista, unincorporated residential areas, and expansive areas of irrigated agriculture. The Department of Water Resources (DWR) originally defined the boundaries of the Bolsa, Hollister, and San Juan Bautista

Subbasins largely based on geology (e.g., extent of alluvium). SGMA established a process for boundary revision, which included an application process in 2016 for local agencies to revise groundwater basin boundaries. The District did not choose to participate in the 2016 process, although it may do so in the future. In addition, DWR realigned some of the boundaries to better align with original descriptions in its Bulletin 118; this included some revision of the District's northern boundary along the Pajaro River, whereby the definition of boundaries was improved by aligning with the Santa Clara-San Benito County line (and District jurisdiction.)

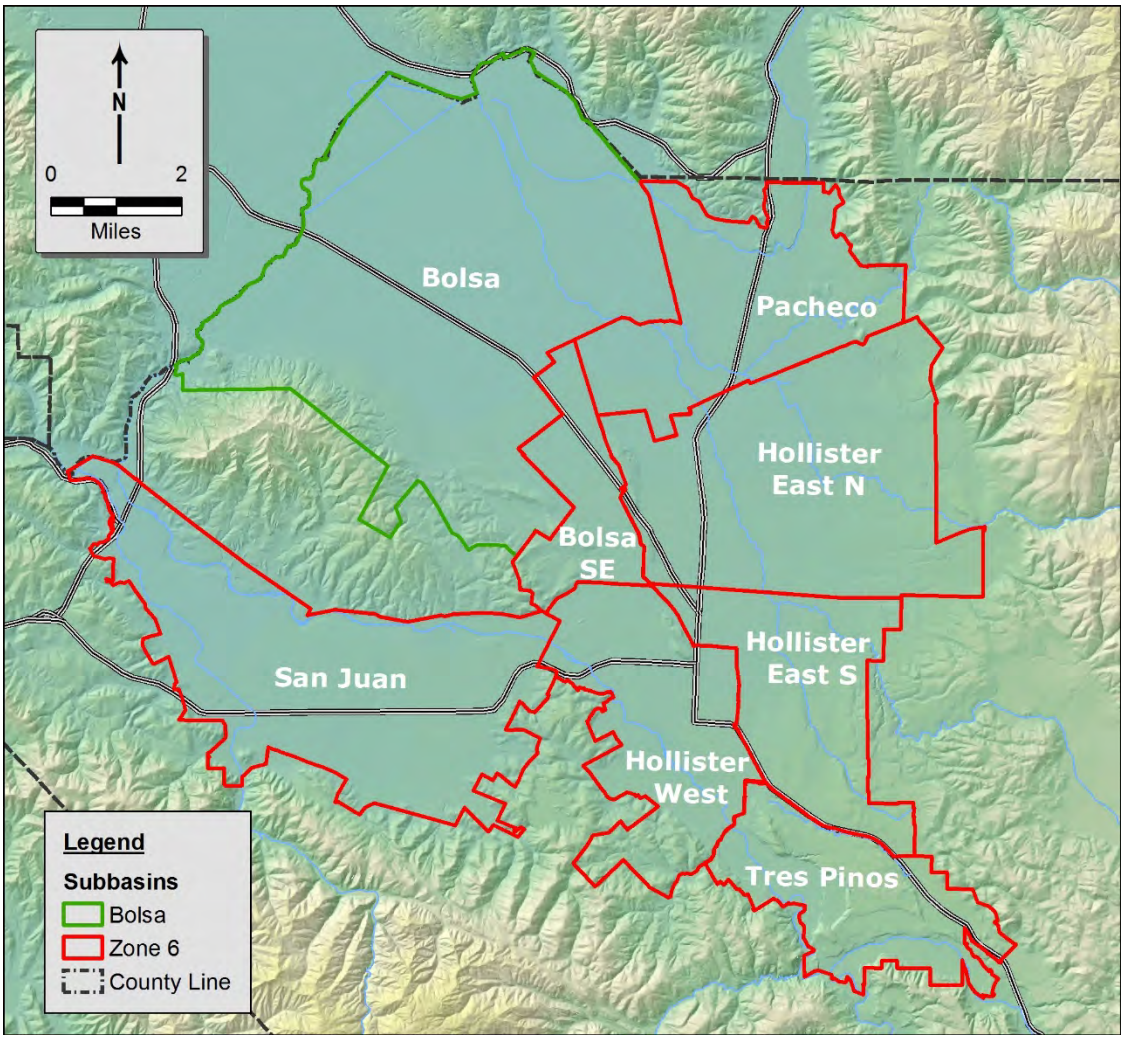
The jurisdiction of the District encompasses all of San Benito County, including all or portions of twelve groundwater basins (see Appendix C). District management of water resources is focused on three Zones of Benefit, listed in **Table 1**. For the purposes of District groundwater management and annual reporting, seven subbasins were delineated in 1996: Bolsa, Bolsa Southeast (SE), Pacheco, Hollister East (North and South), Tres Pinos, Hollister West, and San Juan subbasins (**Figure 2**). These subbasins were defined based on hydrogeologic and significant local factors (i.e., Zone 6 boundaries) and used effectively for management and data collection for the past 19 years. Of the subbasins shown on **Figure 2**, only the Bolsa subbasin receives no CVP deliveries and relies entirely on local groundwater.

The 1996 subbasins differ from the subbasins defined by DWR and identified for compliance with the Sustainable Groundwater Management Act. Recognizing that the DWR boundaries may be revised with approval of DWR (the next opportunity for applications is in 2018), future GSA formation and GSP preparation will be accomplished in terms of DWR defined basins and subbasins. For GSPs and other future reporting, the groundwater data will need to be collected and presented for management areas consistent with DWR defined basins.

Table 1. District Zones of Benefit

Zone	Area	Provides
1	Entire County	Specific District administrative expenses
3	San Benito River Valley (Paicines to San Juan) and Tres Pinos River Valley (Paicines to San Benito River)	Operation of Hernandez and Paicines reservoirs and related groundwater recharge and management activities
6	San Juan, Hollister East, Hollister West, Pacheco, Bolsa SE, and Tres Pinos subbasins	Importation and distribution of CVP water and related groundwater management activities

Figure 2. Locations of SBCWD Subbasins



Hydrologic Conditions

Local rainfall is one indicator of hydrologic conditions in the basin, affecting specific basin inflows (e.g., deep percolation) and outflows (groundwater pumping). Recognizing that drought often is extensive across California, local dry years also may be indicative of regional drought and reduced CVP allocations. Accordingly, dry years often are characterized by increased groundwater pumping for agricultural irrigation to offset lack of rainfall and reduced CVP allocations.

In 2016, overall precipitation was 14.9 inches, which is above the long-term average (1875-2016) of 12.9 inches; 2016 was the first above-average rainfall year since 2011. As shown in **Figure 3**, most of the rainfall fell in a bimonthly pattern: November, January, and March.

Figure 3. Monthly Precipitation in Water Year 2016

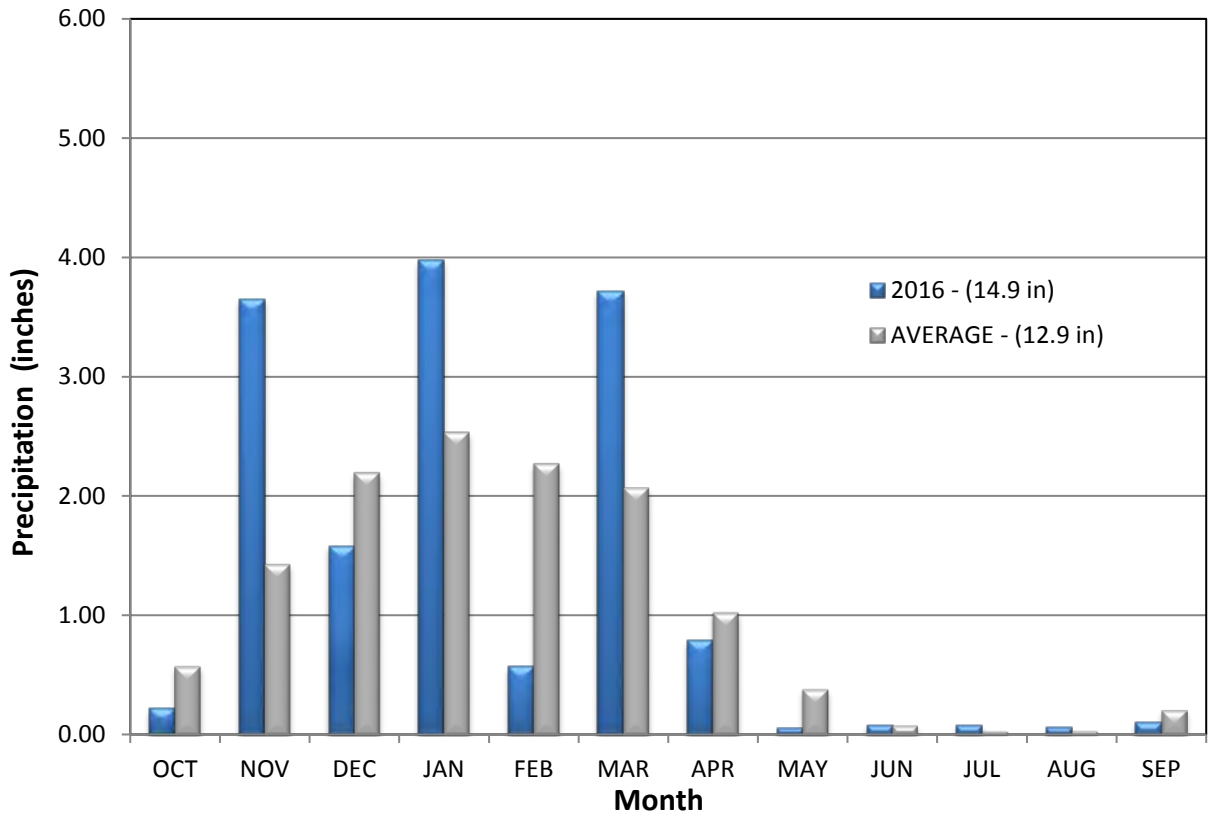
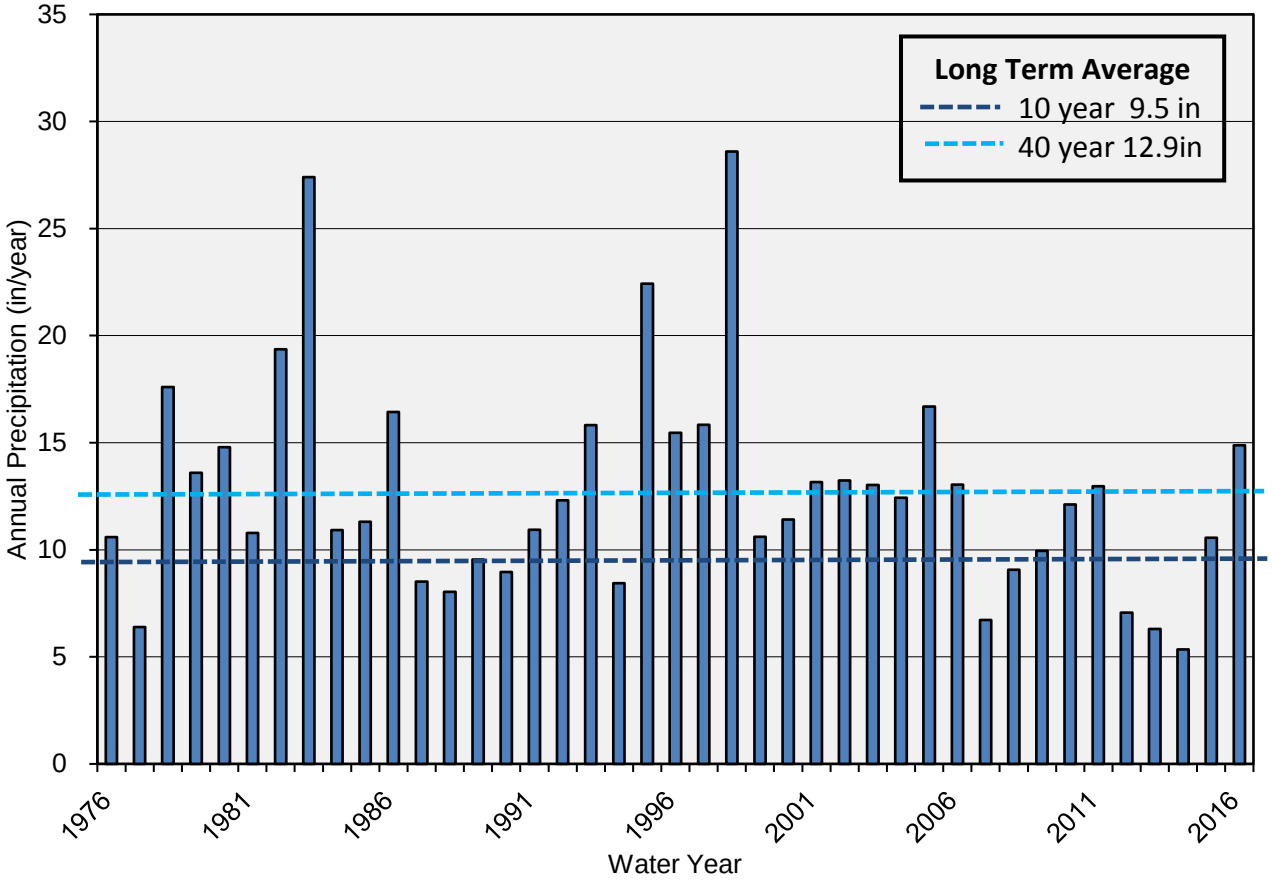


Figure 4 shows annual rainfall from 1976 through 2016. Several notable droughts are shown, including the brief but extreme drought of 1976-1977, the prolonged drought of 1987-1990, the drought of 2007-2009 and the most recent drought beginning in 2012. Average annual precipitation over the past ten years has been significantly less than the long-term average (1875-2016). Even with the recent wet year, the ten-year average is only 9.5 inches, 26 percent less than the long-term average. Relative to historical droughts (see also Appendix B), the recent drought has been both prolonged and extreme.

Recovery of groundwater levels from previous droughts was accomplished with increased use of available imported water (with increased return flows) and recharge of local surface water. (Imported water also was recharged until 2007). While rainfall in water year 2016 was above normal and some groundwater level recovery has occurred, increased CVP allocations are necessary for significant groundwater level recovery.

Figure 4. Annual Precipitation (1976-2016)



2 MANAGEMENT ACTIVITIES

District water management activities, in addition to import and distribution of CVP water, include water resources planning, water conservation, and managed percolation of local surface water to augment groundwater. To track groundwater basin conditions, the District maintains a comprehensive monitoring program, including regular measurement of groundwater pumping, annual evaluation of groundwater storage change, and assessment of regional water quality.

Water Resources Planning

In 2016, the District was engaged in various projects, programs and planning efforts that address water supply and demand, water quality, and wastewater management.

West Hills Water Treatment Plant (WTP). Provision of water treatment allows increased direct use of CVP for municipal and industrial (M&I) purposes; it also allows delivery of improved quality water to customers. West Hills WTP is the second surface water treatment plant to treat CVP imports and allows delivery to urban areas currently not served by the Lessalt Water Treatment Plant. Construction of the West Hills Plant began in 2015 and the plant is expected to be online by summer 2017. With a design capacity of 4.5 MGD, the new WTP will increase the treated M&I CVP water available to the Hollister Urban Area by 2,520 AFY to a total of 4,760 AFY. Eventually, these two facilities will have a combined capacity capable of treating the entire volume of the M&I CVP contract.

Urban Water Management Plan, Hollister Urban Area. In July 2016, the District, in collaboration with Sunnyslope County Water District (SSCWD) and the City of Hollister, completed the latest Urban Water Management Plan (UWMP). The UWMP provides detailed information on the current and future water supply and demand for the Hollister Urban Area, and provides a comparison of supply and demand in normal years plus single-year and multi-year droughts. As documented in the UWMP, the Hollister Urban Area has adequate supplies to meet demands. The UWMP also documents local water conservation measures (see below).

Recycled Water Project. The District has worked cooperatively for many years with the County, City of Hollister, and SSCWD to implement recycled water use. Current recycled water use

includes City of Hollister landscape irrigation. In June 2016, recycled water also was delivered to agriculture users in the Hollister East subbasin area. This extended system has increased the use of recycled water in the District by more than four times the 2015 total, for a total of 499 AF. An additional 250 AF was delivered in October 2016.

Sustainable Groundwater Management Act. SGMA, the most significant groundwater legislation in California history, requires sustainable management by local agencies of DWR-defined groundwater basins. In San Benito County, the subbasins of the Gilroy-Hollister Basin and the Pajaro Valley Groundwater Basin (mostly in Santa Cruz and Monterey counties) are subject to SGMA and must have Groundwater Sustainability Plans (GSPs) in place by 2022 (or 2020 in the case of Pajaro Valley, which has been designated as critically overdrafted).

SGMA evolved significantly in 2016, most notably with completion of detailed DWR regulations for preparing a GSP. In addition, groundwater basin boundaries were modified, including revision by DWR of the District's boundary along the Pajaro River, which was improved by aligning with the Santa Clara-San Benito County line (and District jurisdiction.) Final 2016 boundaries are now available for download from DWR. DWR also released a draft white paper on Water Available for Replenishment (with a report due in December 2016), draft Best Management Practices (BMPs) to help guide preparation of a GSP, and GSP guidance documents, including a draft Preparation Checklist for GSP Submittal and a draft GSP Annotated Outline. Other documents are in preparation; overall these are intended to assist GSAs in preparing GSPs.

As documented in the 2015 Annual Report, it was recommended that the District assume the responsibilities of a GSA and subsequently prepare a GSP for the subbasins of the Gilroy-Hollister Basin in San Benito County. Where portions of a basin overlap neighboring jurisdictions, it was recommended that the District work with the respective agency toward collaborative compliance with SGMA.

The next major milestone is establishment of a Groundwater Sustainability Agency (GSA) for local basins; the deadline is June 30, 2017. In 2016, District planning for SGMA included consideration of next steps for forming a GSA and for planning and funding a GSP, plus discussions with neighboring agencies. While GSA formation does not require much technical work, it does entail several steps. It is recommended that the District begin the process as soon as possible; this would provide time to resolve unforeseen issues and, once completed, allow the District to consider next steps, such as acquisition of funding. The competitive application process for Proposition 1 bond funds is likely to begin in 2017.

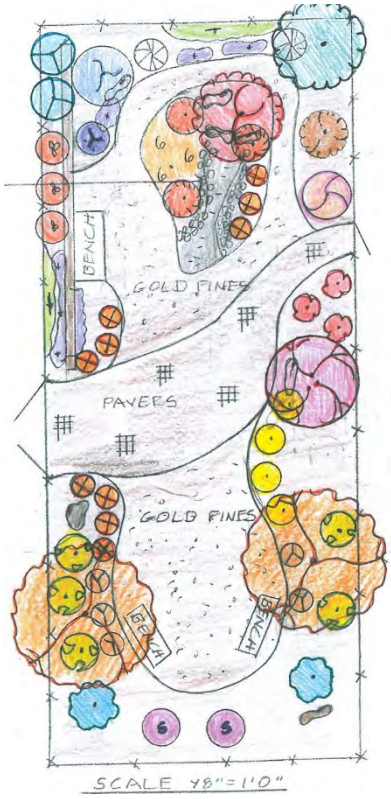
Water Conservation

Water conservation is an important tool to manage demands on the groundwater basin. During the most recent drought, the state has mandated water retailers to reduce their demand. This state-ordered demand reduction, together with the expansion of ongoing water conservation efforts, successfully lowered water demand. Water conservation efforts in San Benito County are conducted mostly through the Water Resources Association (WRA), composed of representatives from the District, City of Hollister, City of San Juan Bautista, and Sunnyslope County Water District.

Ongoing Conservation. The State has lifted mandatory water demand reductions for agencies; nonetheless, the Hollister Urban Area continues voluntary demand reductions. The managers at Hollister and SSCWD plan to continue water demand reductions; their goal for total usage is 15 percent less than 2013 demands. Currently, the Hollister Urban Area is exceeding this goal with about 22 percent less than 2013 demands.

Water Shortage Contingency Plan (WSCP). As part of the Urban Water Management Plan (UWMP), Hollister, SSCWD, and the District developed a joint WSCP. The plan includes many permanent prohibitions on water waste (including using water to clean paved surfaces and watering lawns within 48 hours of rain). In addition, the plan details what water conservation measures are triggered during drought conditions.

Irrigation Education. The District, in collaboration with the WRA, continues to offer a series of classes on irrigation efficiency and other agriculture practices. Since 2009, these workshops provide concepts, tools, and examples for optimizing irrigation and nitrogen management efficiency in row, tree, and greenhouse crop production.



Water Wise Demonstration Garden and Plans. WRA maintains a demonstration garden at Dunne Park in downtown Hollister (corner of 6th & Powell). Their website offers a map (see right inset) and brochure to help educate visitors on drought resistant landscaping. The WRA website also provides three sample Water Efficient Landscape Plans available for download.

Turf Removal Program. In July 2014, the WRA added a Turf Removal Program to encourage customers to remove high water use turf areas from residential parcels. This program complements the irrigation hardware rebates and free water efficient landscape plans. In Fiscal Year 15/16 the program expanded from offering a $1 per square of turf removed up to 500 square feet to 1,000 square feet. As of November 2016, over 145,500 square feet of turf have been removed in the Hollister Urban Area.

Public Outreach. WRA continues to educate the public about the regional water system and water use efficiency. WRA has given presentations to local school and lead school groups to the local WTP and WWTP, reaching over 400 students in autumn 2016 alone. Other outreach programs have provided water conservation outreach to 75 high school students this year.

Other ongoing water conservation programs involve irrigation rebates, toilet replacements, high-efficiency clothes washer rebates, education program and outreach. These water conservation programs, while successfully reducing water demand, are being continued and diversified to encourage the public to continue to use water wisely.

These water conservation programs, while successfully reducing water demand, are being continued and diversified to encourage the public to continue to use water wisely.

Managed Percolation

Percolation of Local Surface Water. In most years, local surface water released from Hernandez and Paicines Reservoirs is percolated along the San Benito River and Tres Pinos Creek. Releases have been limited to percolate upstream of the confluence of San Benito River and Tres Pinos Creek. This helps maintain groundwater levels without causing shallow groundwater problems and competing for available storage space with City of Hollister wastewater percolation. This year, for the third year in a row, there were no releases from Paicines; 925 AF was released from Hernandez.

Percolation of Wastewater. Wastewater is percolated by the City of Hollister at its Domestic and Industrial plants, and is also percolated at the SSCWD Ridgemark Facilities and by Tres Pinos Water District. Recent changes in operation of the wastewater facilities have decreased the volume percolating to the groundwater. Information about the amount of groundwater recharged from these wastewater facilities is found in Appendix D.

Percolation of CVP Water. In the past, CVP percolation was used to recharge the groundwater basin. CVP percolation peaked in 1997 and was reduced subsequently in response to the successful recovery of the groundwater basin from overdraft. Direct in-stream recharge of CVP water is not expected to occur because of concerns for release of invasive Dreissenid mussels. A table of historical percolation is found in Appendix D.

Monitoring Program

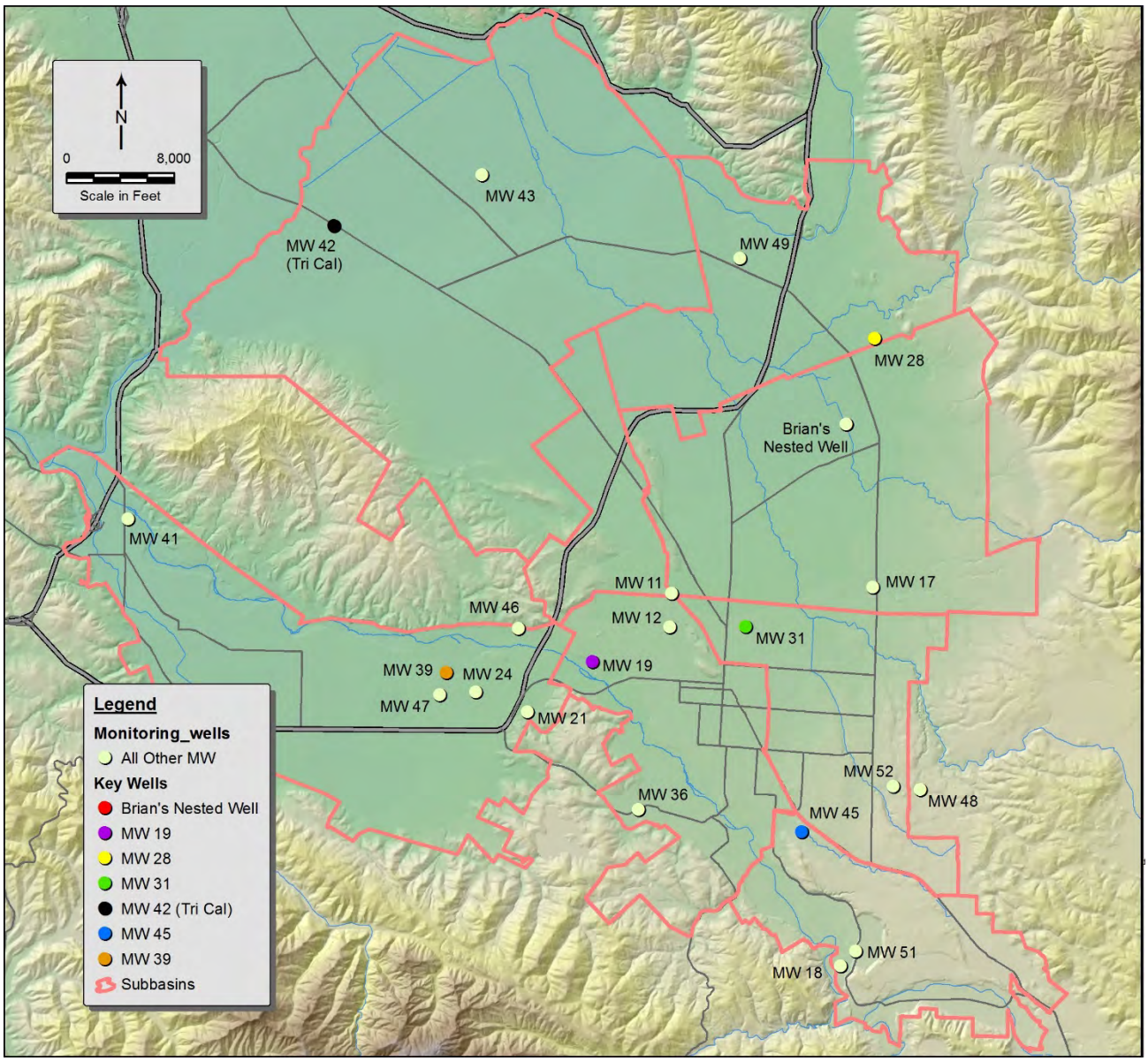
Development, implementation, and documentation of a monitoring program is a vital element of a Groundwater Sustainability Plan (GSP). It is basic to understanding how the surface water-groundwater system works, documenting groundwater conditions, and evaluating the effectiveness of management programs. Consistent with its governing law, the District has been monitoring and providing annual reports for decades; monitoring data are provided in the appendices. Understanding that a GSP will require extensive documentation of the monitoring networks and protocols, the District monitoring program can be summarized as follows:

- Climate monitoring at the District CIMIS station
- Streamflow measurements at 25 sites at least quarterly
- Groundwater elevation measurements at 90 sites (spring and fall)
- Groundwater quality sampling at 18 sites (spring and/or fall)
- Monitoring of reservoir water budgets and releases for percolation
- CVP allocation and use by type and subbasin
- Groundwater pumping and use by type and subbasin
- Recycled water use and discharge

3 WATER QUALITY

The District currently monitors a distributed network of 18 wells for water quality, shown in **Figure 5**. Data from these monitoring wells and other water quality data are included in Appendix G. The District maintains a comprehensive water quality database, created in 2004 with a State Local Groundwater Assistance Grant and updated every three years. This year, the database was updated with readily available data from the District, Regional Water Quality Control Board, California State Water Resources Control Board, Tres Pinos Water District, City of Hollister, and SSCWD. The database now contains over 450,000 records from 175 water systems or regulated facilities and over 1,800 monitoring locations.

Figure 5. District Monitoring Locations



Salt and Nutrient Management Plan

The San Benito County Salt and Nutrient Management Plan (SNMP) was developed for the basin in 2014, consistent with the 2013 State Water Resources Control Board (SWRCB) statewide Recycled Water Policy. The purpose of the SNMP was to identify all sources of salts and nutrients (both current and future) in the basins and to manage those salt and nutrient sources in a manner that ensures that groundwater is safe for drinking and all other beneficial uses. The District's SNMP analysis demonstrated that the both single and multiple recycled water irrigation projects planned through 2021 use less than 1% of the available TDS and nitrate assimilative capacity, the difference between average salt and nutrient concentrations in the basin and the respective basin plan objectives. Therefore, the irrigation projects satisfy the Recycled Water Policy criteria. The SNMP analysis found that recycled water use can be increased while still protecting groundwater quality for beneficial uses.

Based on the analysis, the SNMP concluded no additional implementation measures are warranted beyond those that have been implemented and those that are already planned. Nonetheless, the SNMP management process is active and ongoing, and continued water quality monitoring will ascertain the effectiveness of implementation measures.

With respect to monitoring, the Recycled Water Policy states that the Salt and Nutrient Management Plan (SNMP) should include a monitoring program that consists of a network of monitoring locations ". . . adequate to provide a reasonable, cost-effective means of determining whether the concentrations of salts, nutrients, and other constituents of concern as identified in the salt and nutrient plans are consistent with applicable water quality objectives." Additionally, the SNMP is required to focus on basin water quality near water supply wells and areas proximate to large water recycling projects, particularly groundwater recharge projects (Todd, 2014).

The SNMP Monitoring Plan laid out a program wherein the data collected and compiled by the District are analyzed and reported to the RWQCB every three years as part of the District's triennial Groundwater Report. The analyses are required to include the following:

- Discussion of Total Dissolved Solids (TDS) and nitrate in groundwater including,
    - Time-concentration plots,
    - Evaluation of vertical variation in water quality,
    - Water quality concentration maps,
    - Comparison of detections with basin-specific basin plan objectives (BSPOs), and
- Status of recycled water use and stormwater capture projects and implementation measures.

The following subsections summarize key constituents, time concentrations plots, vertical variation and areal distribution and BSPOs; discussion of recycled water and stormwater is provided in the following section.

Key Constituents

Total dissolved solids (TDS) and nitrate are the indicator salts and nutrients and the key constituents of concern (COCs). TDS data are available for both inflows and outflows from the basin. While TDS is an indicator of anthropogenic impacts (e.g., infiltration of urban runoff, agricultural return flows, and wastewater disposal), there is also a relatively elevated natural background TDS concentration in groundwater. This has been documented since the 1930s and has been ascribed to the presence of marine sediments in the watershed.

Nitrate is the primary form of nitrogen detected in groundwater and natural nitrate levels in groundwater are generally very low. Elevated concentrations of nitrate in groundwater are associated with agricultural activities, septic systems, confined animal facilities, landscape fertilization, and wastewater treatment facility discharges. The maximum contaminant level (MCL) for nitrate (as NO3) is 45 mg/L. Nitrate data are available for basin inflows and outflows, and as documented in the SNMP, elevated nitrate concentrations have been a recognized, long-term concern in the basin.

Hexavalent chromium (also known as chromium VI, or CrVI) has been added as a key constituent of concern. This reflects the newly reduced California maximum contaminant level (MCL) of 10 micrograms per liter (µg/L) (SWRCB 2015). Recent analyses of water quality in some Hollister wells reported hexavalent chromium concentrations above the MCL.

These three constituents (which vary over time, space and depth) indicate general changes in groundwater quality. Previous water quality studies have identified other constituents of concern including boron, chloride, hardness, metals, sulfate, and potassium. In some parts of the basin, groundwater does not meet water quality standards for these constituents relative to the intended beneficial uses of the groundwater. Specific information (including water quality standards and number of samples that exceed standards) is presented in Appendix G.

Water Quality Goals

Water quality goals were developed for the Salt Nutrient Management Plan. The General Basin Plan Objectives (GBPOs) for groundwater with municipal and domestic water supply and agricultural water supply beneficial uses in the Central Coast are shown in **Table 2**. The DDW has adopted Secondary Maximum Contaminant Levels (SMCLs) for TDS; SMCLs address aesthetic issues related to taste, odor, or appearance of the water and are not related to health effects. Nonetheless, elevated TDS concentrations can affect its desirability for irrigation uses. The recommended SMCL for TDS is 500 mg/L with an upper limit of 1,000 mg/L. It has a short-term limit of 1,500 mg/L.

The primary maximum contaminant level (MCL) for nitrate (as N) is 10 milligrams per liter (mg/L), or as expressed in this report in terms of nitrate (as NO3), the MCL is 45 mg/L. These MCLs are based on health concerns due to methemoglobinemia, or "blue baby syndrome," which affects infants, ruminant animals (such as cows and sheep) and infant monogastrics (such as baby pigs and chickens). Elevated levels may also be unhealthy for pregnant women (SWRCB, 2010).

The SNMP also developed basin specific plan objectives, listed in **Table 3**, with a TDS assimilative capacity benchmark of 1,200 mg/L for the DWR San Juan and Bolsa Subbasins. Ambient groundwater quality in the San Juan Bautista and Bolsa Subbasins is similar to or slightly poorer than in the Hollister subbasin; thus use of the same TDS objective is deemed reasonable. The GBPO for nitrate-NO3 (45 mg/L) is applied to assimilative capacity calculations in the DWR San Juan Bautista and Bolsa Subbasins (Todd, 2014).

Table 2. General Basin Plan Objectives

Parameter	**Units**	Municipal	**Ag**
TDS	mg/L	500/1,000/1,500[1]	450
Nitrate (as NO3)	mg/L	45	100[2]
Nitrate + Nitrite-N	mg/L	10	100 [2]

MUN – municipal AGR – agricultural mg/L – milligrams per liter

1 - The levels specified for TDS and chloride are the "recommended" levels for constituents with secondary maximum contaminant levels

2 - For livestock watering

Table 3. Basin-Specific Basin Plan Objectives

Parameter	Units	Municipal	
		Hollister	Tres Pinos
TDS	mg/L	1,200	1,000
Nitrogen (as N)	mg/L	5	5
Nitrate (as NO**3**)	mg/L	22.5	22.5

California recently reduced the maximum contaminant level (MCL) for hexavalent chromium (also known as chromium VI, to 10 micrograms per liter (µg/L) (SWRCB 2015). Exceedances of water quality goals for all major constituents are included in Appendix G.

Key Constituents Results

Table 4 shows current average concentrations for each subbasin for TDS and nitrate. The values were developed by averaging all drinking water and ambient monitoring events that occurred from 2013-2016; water quality samples from regulated facilities were not included in the analysis. These average conditions serve as a snapshot for each subbasin and allow a simple comparison of water quality conditions across the basin.

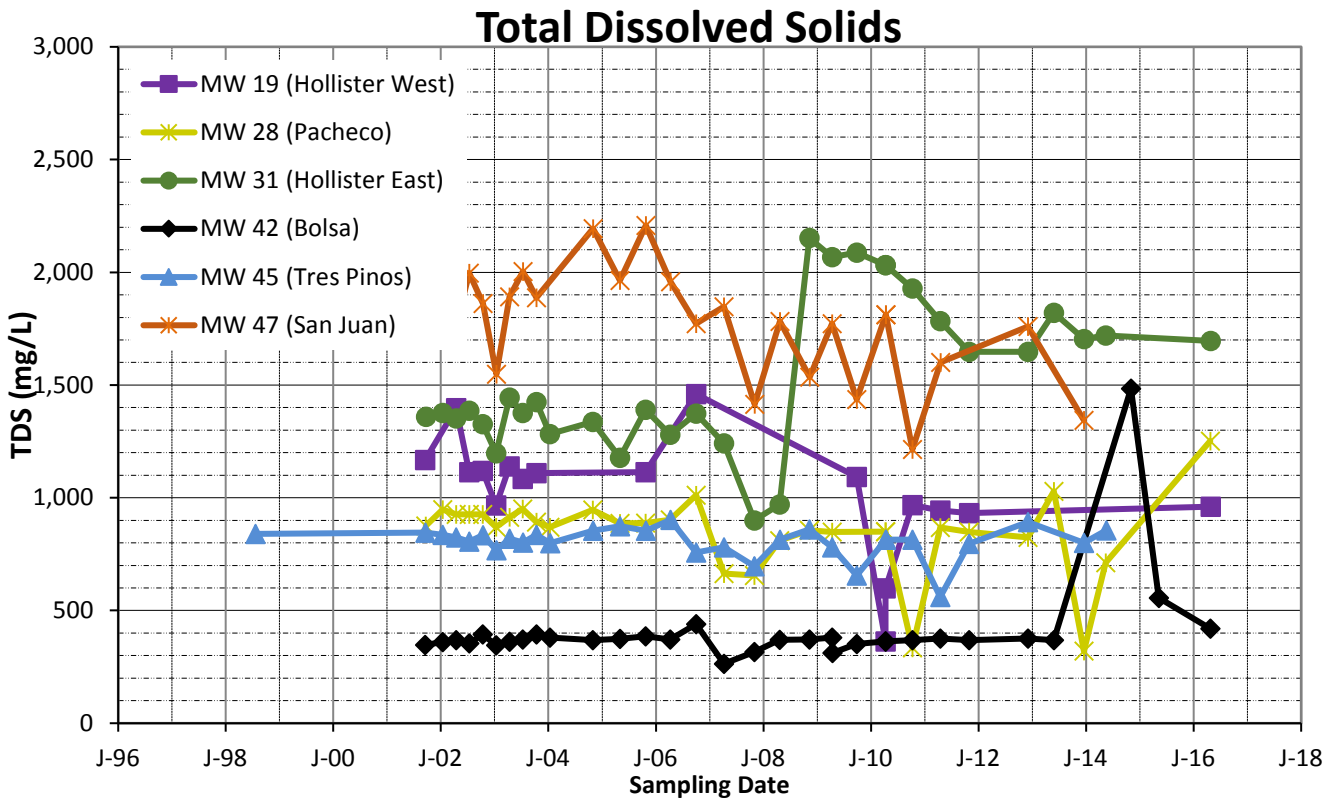
Table 4. Average Constituent Concentrations by Subbasin 2013-2016 (mg/L)

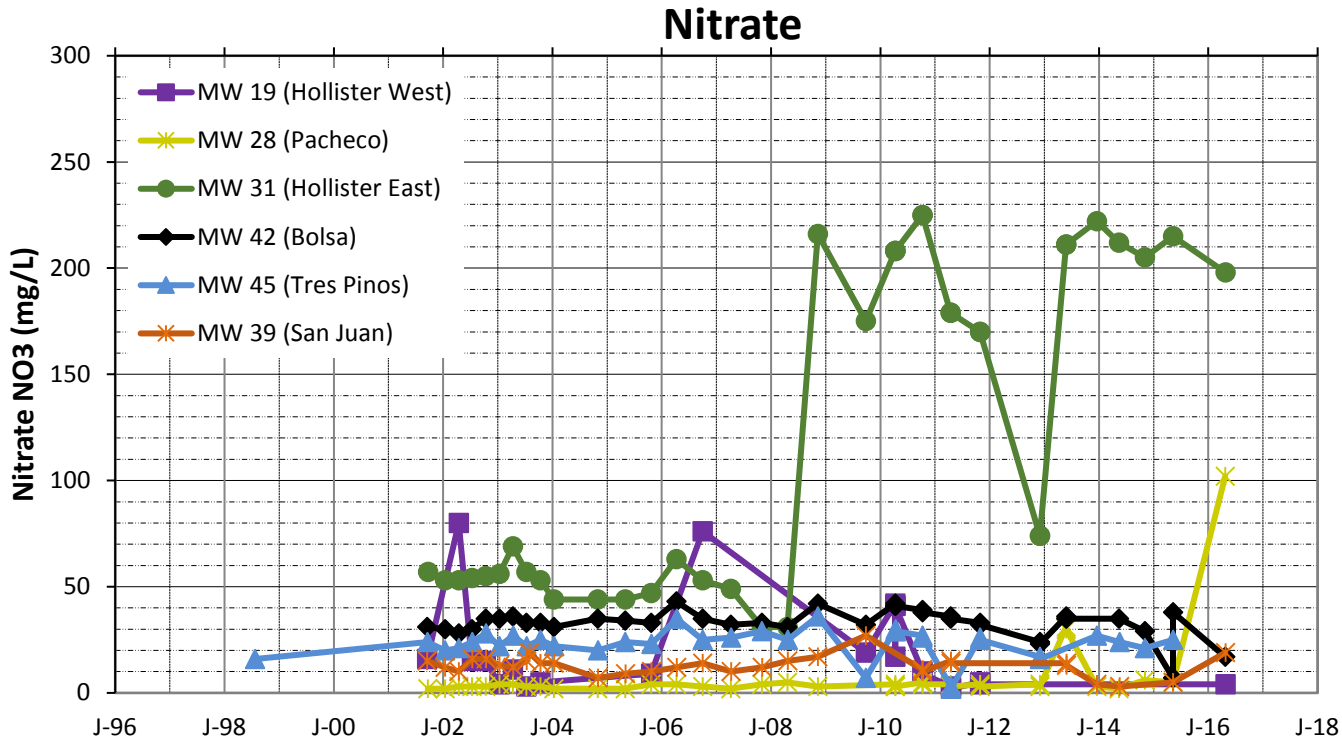
Subbasin	NITRATE (AS NO3)	TOTAL DISSOLVED SOLIDS
Bolsa	31.4	444
Bolsa Southeast	25.1	Not available*
Hollister East	17.6	1,485
Hollister West	34.4	968
Pacheco	12.9	572
San Juan	19.8	1,643
Tres Pinos	10.3	788
Paicines	4.4	260
Outside subbasins	5.8	633

*No TDS samples were reported from drinking water or monitoring wells.

While **Table 4** provides a current snapshot of groundwater quality, **Figure 6**, the time concentration plots, show concentrations of TDS and nitrate in selected wells over the past 13 years. These wells were selected to show significant trends in each subbasin. The following sections summarize current conditions and trends for TDS and nitrate, respectively.

Figures 6a and 6b. Time Concentration Plots of Key Monitoring Wells.





Total Dissolved Solids (TDS). As documented in **Table 4**, TDS concentrations are generally high in all subbasins. The northern subbasins (Bolsa and Pacheco) show relatively low concentrations and San Juan has the highest levels of TDS. As shown in **Table 4**, the average TDS concentrations in each of the subbasins (except Bolsa) exceed the secondary MCL for drinking water (500 mg/L). The very high TDS concentrations in MW31 probably indicate a local source. Average TDS concentrations are high in Hollister East and San Juan, and moderately high in Hollister West. These concentrations reflect both anthropogenic and natural sources.

As shown in **Figure 6a**, TDS concentrations in the basin are high and show variability over time and space. All subbasins have TDS concentrations at or above the agricultural water quality goal of 450 mg/L. In the last three years (since the last update), TDS concentrations have remained stable or decreased. In the San Juan subbasin, some wells downstream of the historical wastewater treatment ponds (e.g., MW47) show a general decrease in concentrations, possibly due to the reduced percolation of wastewater in recent years. However, water quality samples in this region continue to have high TDS concentrations relative to the rest of the basin.

In considering the last three years, MW 28 (in the Pacheco subbasin) has shown a noticeable increase; the May 2016 monitoring event recorded uncharacteristically high nitrate and higher than average TDS. Additional monitoring and investigation at this well should continue to see if this is indicative of actual quality changes or a data outlier reflecting procedural problems.

In Appendix G, **Figure G-3** shows the maximum concentrations at each well in the basin that has been sampled since 2013 (the last database update) for TDS.

Nitrate as NO3. As documented in **Table 4**, average nitrate conditions are high in all subbasins; the average nitrate concentrations in Hollister West and Bolsa are above 30 mg/L. The sources of these high concentrations are not known; however, wastewater disposal in Hollister West has contributed to high nitrate in the past. Bolsa has long been an agricultural area and agricultural practices and livestock would contribute to high nitrate.

Nitrate, long identified as a COC in the basin, has multiple and widespread sources including fertilizer application and wastewater disposal (both municipal and domestic). Given that these sources are on or near the ground surface, shallow groundwater typically is characterized by higher concentrations than deep groundwater. In fact, the highest recent concentrations occurred in shallow wells in the eastern San Juan subbasin. It should be noted that many of the samples from the San Juan subbasin are from monitoring wells positioned downgradient from the former wastewater percolation ponds. Review of **Table G-1** in Appendix G indicates that in the past, monitoring wells (e.g., MW 24 and MW47) in San Juan have shown elevated nitrate above 100 mg/L, however the currently monitored wells show much lower concentrations.

Figure 6b shows nitrate time concentration plots from selected monitoring wells. Nitrate concentrations are elevated above natural concentrations (typically less than 10 mg/L), but most samples have indicated nitrate concentrations below the MCL of 45 mg/L. With some exceptions, concentrations are relatively stable over time. Two wells (MW 39 and MW 28) had shown consistent nitrate concentrations until the 2016 monitoring event, when both wells showed increased nitrate concentrations. Continued monitoring should aid in identification of specific locations and changes in nitrate concentration.

The extremely high concentrations in Hollister East well MW31 appear anomalous and likely reflect a local, nearby source. **Figure G-4** shows the maximum concentrations at each well in the basin that has been sampled since 2013 (the last database update) for nitrate.

Chromium VI. Chromium VI concentrations in water samples from several City of Hollister water supply wells exceed the new MCL. In brief, 95 wells were tested for Chromium VI across the basin, 32 wells detected some level of Chromium VI, and 5 wells showed an exceedance of the new water quality goal. Most of the wells with detections are operated by the City of Hollister.

These problematic concentrations occurred in the four Hollister active water supply wells located on the west side of the City (Todd 2015b). Treatment for CrVI is expensive, and not all wells have equal treatment options. As such, Hollister is pursuing the option of blending groundwater from the existing wells with treated imported water from the West Hills WTP currently under construction. DDW has approved the HUA's proposal for a 50/50 blend of groundwater and treated water from the West Hills WTP (SWRCB 2016). Sunnyslope is currently monitoring their wells for CrVI and will continue to plan for possible water quality issues. **Figure G-5** shows the monitoring and detections of CrVI since 2013 (the last database update).

Vertical Variations

In 2006, a nested well (funded in part by a State Local Groundwater Assistance Act grant) was completed in Hollister East to study vertical distribution of groundwater quality in an area of elevated TDS and boron. The nested well has five depth-specific ports: A through E from shallow to deep. Water quality concentrations for each port for TDS and nitrate are available in Appendix G. More frequent monitoring in recent years is beginning to reveal patterns; for example, the middle ports (C and D) are showing high TDS concentrations relative to shallow and deep ports. This may indicate a mid-range source of local poor water quality; we note that original siting of this nested well accounted for proximity to a geologic fault at depth. However, naturally high TDS and boron can also be found at depth reflecting regional geology. Across the basin, shallow groundwater generally has relatively high concentrations of TDS and nitrate reflecting agricultural drainage and other anthropogenic sources.

SNMP Compliance

Water quality in the basin has not changed significantly since the SNMP concluded that recycled water would not adversely impact water quality. Concentrations of nitrate and TDS remain fairly stable across the subbasin. Active, ongoing and continued water quality monitoring should continue to track water quality changes and increase the understanding of water quality variation spatially and with depth.

4 WATER USE

Water Supply Sources

San Benito County has four major sources of water supply for municipal, rural, and agricultural land uses. These are summarized below; for more data and graphs see Appendix E.

- **Local Groundwater.** Groundwater is withdrawn from the basin by private irrigation and domestic wells and by public water supply retailers. The District does not directly produce or sell groundwater, but is active in groundwater management throughout San Benito County. This report focuses on the southern part of the Gilroy-Hollister groundwater basin (DWR Basin 3-3) and reports on eight District-defined subbasins.
- **Imported Water.** The District purchases Central Valley Project (CVP) water from the U.S. Bureau of Reclamation (USBR). The District has a 40-year contract (extending to 2027) for a maximum of 8,250 AFY of M&I water and 35,550 AFY of agricultural water.
- **Recycled Water.** Recycled water is now available for selected ag users as well as continue irrigation for a municipal park. Recycled water use was 499 AF in WY 2016 and is expected to continue to increase. This source is generally reliable during drought and helps secure a sustainable water supply.
- **Local Surface Water.** Surface water is not used directly for potable or irrigation use in the basin, but creek percolation is a significant source of groundwater recharge. In 2016 there were limited storage releases from the District's Hernandez reservoir and none from Paicines. Stormwater reuse is not a significant source of recharge in the basin. However, some stormwater is directed to the Hollister Industrial WWTP via a combined sewer system for treatment and discharge to percolation and evaporation ponds included in the percolation totals in Appendix D.

Available Imported Water

The District distributes CVP water to agricultural and M&I customers in Zone 6. In USBR contract year 2016 (March 2016 - February 2017), water allocations were reduced by USBR to 5 percent of the contract for agriculture and 55 percent of the contract for M&I. **Table 5** shows the contract entitlements and recent allocations (SLDMWA 2016). Note that USBR contract years are March through February, so water year 2016 overlapped two contract years.

The District renegotiated their shortage policy with USBR in 2014. Now the District will receive the allocated percent of their full M&I contract (8,250 AFY), even in dry years. In past years if the allocation was decreased due to water shortage (an allocation of 75 percent or less), the District received the allocated percent of their historic use. In 2014 for example, the historic use was 5,556 AFY. In Water Year 2016, the District is allocated 55 percent of their full contract (8,250 AFY).

Table 5. CVP Entitlements and Allocations, USBR Contract Years 2015-2016

March 2015 - February 2016

	Shortage Year Adjustments	% Allocation	Allocation Volume (af)
Agriculture	38,244	0%	0
M&I	8,250	25%	2,063
TOTAL	**43,800**		**2,063**

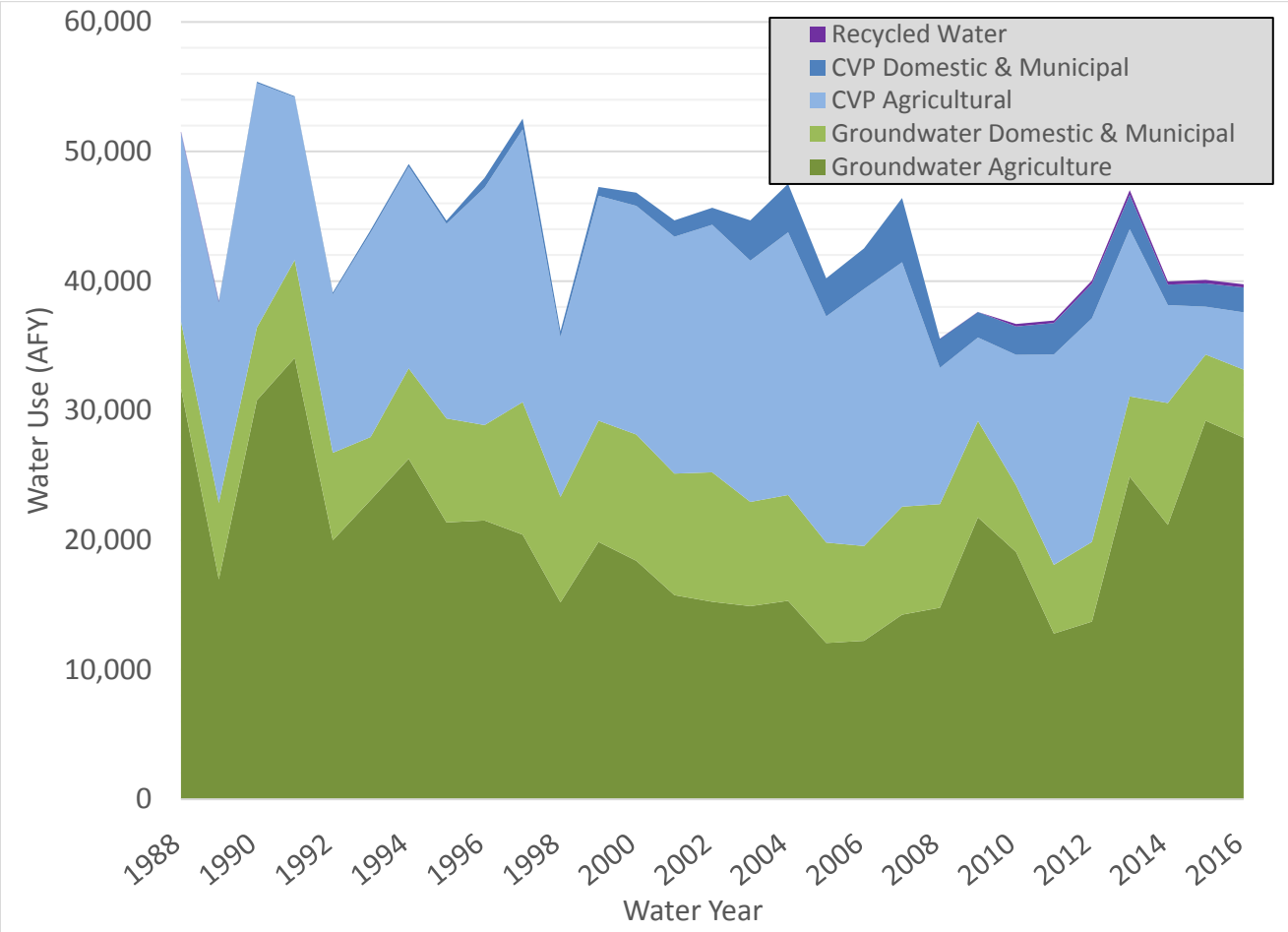
March 2016 - February 2017

	Shortage Year Adjustments	% Allocation	Allocation Volume (af)
Agriculture	38,244	5%	1,912
M&I	8,250	55%	4,538
TOTAL	**43,800**		**6,450**

Water Use

In 2016, total water use was similar to 2015 water use, just over 40,000 AF. **Figure 7** shows the total water use from 1988 through 2016. As indicated, groundwater pumped by agricultural users has represented the largest portion of water use in recent dry years when CVP allocations were reduced. **Figure 7** also shows that overall water demand has generally declined due in part to drought conservation.

Figure 7. Total Water Use by Source and use 1988-2016 (AFY)



Distribution of Demand by Source and Use

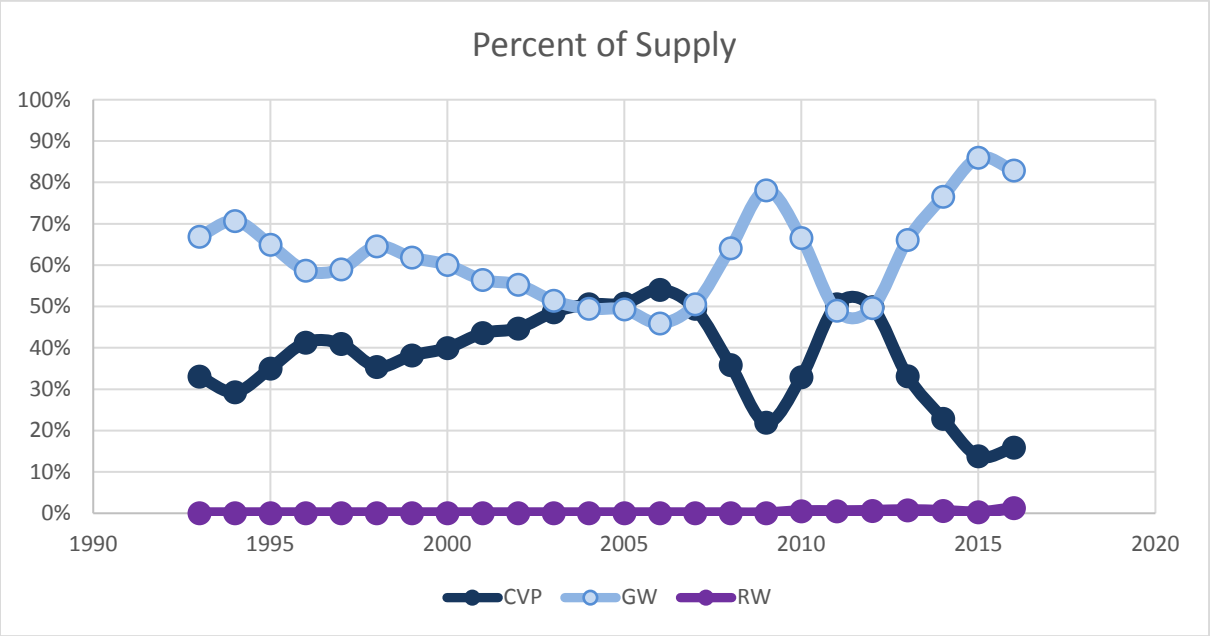
Water year 2016 saw a small increase in the availability of CVP water and recycled water. For the first time, recycled water was supplied to agriculture users in the Hollister East and Bolsa South East subbasins. While total recycled water deliveries only represent one percent of supply, use has quadrupled since 2015. **Table 6** shows the total water deliveries from CVP, groundwater (GW), and recycled water (RW) sources.

Table 6. Total Water Deliveries for Water Year 2016 (AF)

	CVP		GW		RW		Total	
	2015	2016	2015	2016	2015	2016	2015	2016
Agriculture	3,697	4,434	29,229	27,912	-	246	32,926	32,591
M&I	1,810	1,914	5,099	5,251	101	253	7,010	7,417
TOTAL	**5,507**	**6,347**	**34,327**	**33,162**	**101**	**499**	**39,935**	**40,008**

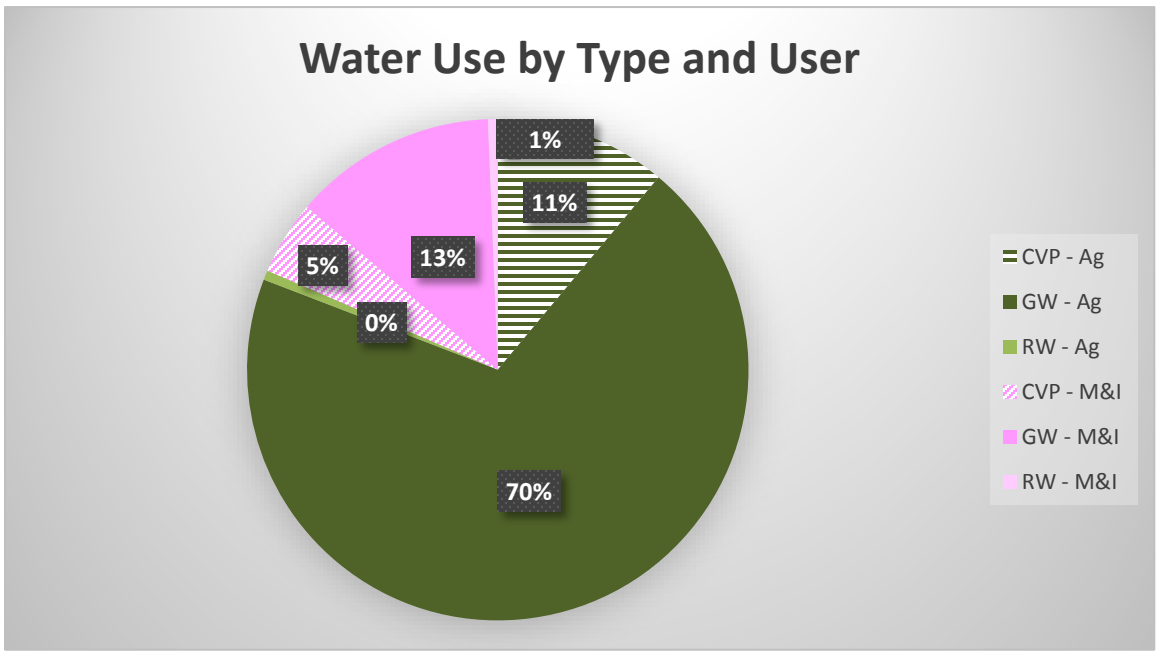
In 2016, groundwater represented 83 percent of total supply, again mostly due to increases in groundwater pumping for agricultural use. While the percent of supply from groundwater is less than 2015 (86 percent), it remains a much larger portion of total supply than the period of record. **Figure 8** on the following page shows that since 1991, groundwater has averaged only 62 percent of supply but increased periodocally due to drought and reduced CVP allocations.

Figure 8. Percent of supply by source, 1991- 2016



Agricultural irrigation has represented most water use, ranging from 71 to 90 percent of total demand. In 2016, this sector represented 81 percent of demand. Groundwater for agriculture use is the highest water use/water source combination in most years, averaging 46 percent of total demand from 1988 through 2016. In 2016, groundwater use for agriculture represented 70 percent of the total water use. With the exception of last year, groundwater for agriculture uses is the highest portion of total water use since 1988. **Figure 9** shows the breakdown of water use by source and user.

Figure 9. Percent of supply by source and user, 2016



Municipal and domestic use increased slightly in water year 2016, but remained lower than the average over the period of record. Urban demand remained low in a large part due to water conservation. In the past, use of CVP water for direct M&I use was usually limited by the available treatment capacity of the Lessalt treatment plant. This is the first full year after the plant was expanded: in 2016, Lessalt served 1,682 AF, the highest volume since 2007.

Water year 2016 was the first year in which recycled water was delivered to both agriculture and municipal customers.

Distribution by Subbasin

Water use by subbasin remained similar as in previous years, with groundwater making up a large portion of supply in Bolsa South East, San Juan, and Tres Pinos subbasins. **Table 7** shows the water use by user, and water type for each subbasin. Graphs showing total water use by water source are available in Appendix E.

Table 7. Zone 6 Water Use in Water Year 2016 (AF)

		CVP Water		Groundwater		Recycled Water	
Subbasin	**TOTAL**	**Agriculture**	**Domestic & Municipal**	**Agricultural**	**Domestic & Municipal**	**Agricultural**	**Domestic & Municipal**
Bolsa South East	2,626	30	0	2,533	24.8	38	0.0
Hollister East	11,401	3,059	1,752	5,518	865	207	0
Hollister West	4,446	157	5	2,036	1,996	0	253
Pacheco	4,806	396	24	4,220	167	0	0
San Juan	14,399	742	77	13,084	497	0	0
Tres Pinos	2,329	51	56	522	1,701	0	0
TOTAL	**40,008**	**4,434**	**1,914**	**27,912**	**5,251**	**246**	**253**

5 WATER LEVELS

In October 2016, groundwater levels continued to decline in areas of the basin that rely on groundwater, specifically in the Bolsa, San Juan, Hollister West, Bolsa SE, and Tres Pinos subbasins. While some subbasins showed groundwater level increases, overall groundwater in storage decreased. Groundwater elevation declines and storage decreases during drought do not constitute overdraft; nevertheless, the continued reduced supplies of imported water in tandem with increased groundwater demands are a warning of potential overdraft.

The groundwater level analysis depends on a consistent network of reliable wells. The number of wells in the District's groundwater monitoring program for the autumn was at an all-time low, increasing the uncertainty of a subbasin wide storage change calculations. In addition, the set of wells monitored was different from that monitored in previous years in some key locations. It is recommended that the District assess the monitoring network and redouble efforts to record water levels in a stable network of wells on a quarterly basis. If for some reason wells are no longer part of the network they should be replaced as soon as possible with a nearby, comparably-constructed well that can serve as a permanent addition to the network.

The District should continue to manage groundwater resources for substantial and rapid recovery in wet years, recognizing that most years are average to dry and wet years are less frequent. Additional information on groundwater elevations (including profiles of basin cross sections and depth to water contours) are included in Appendix C.

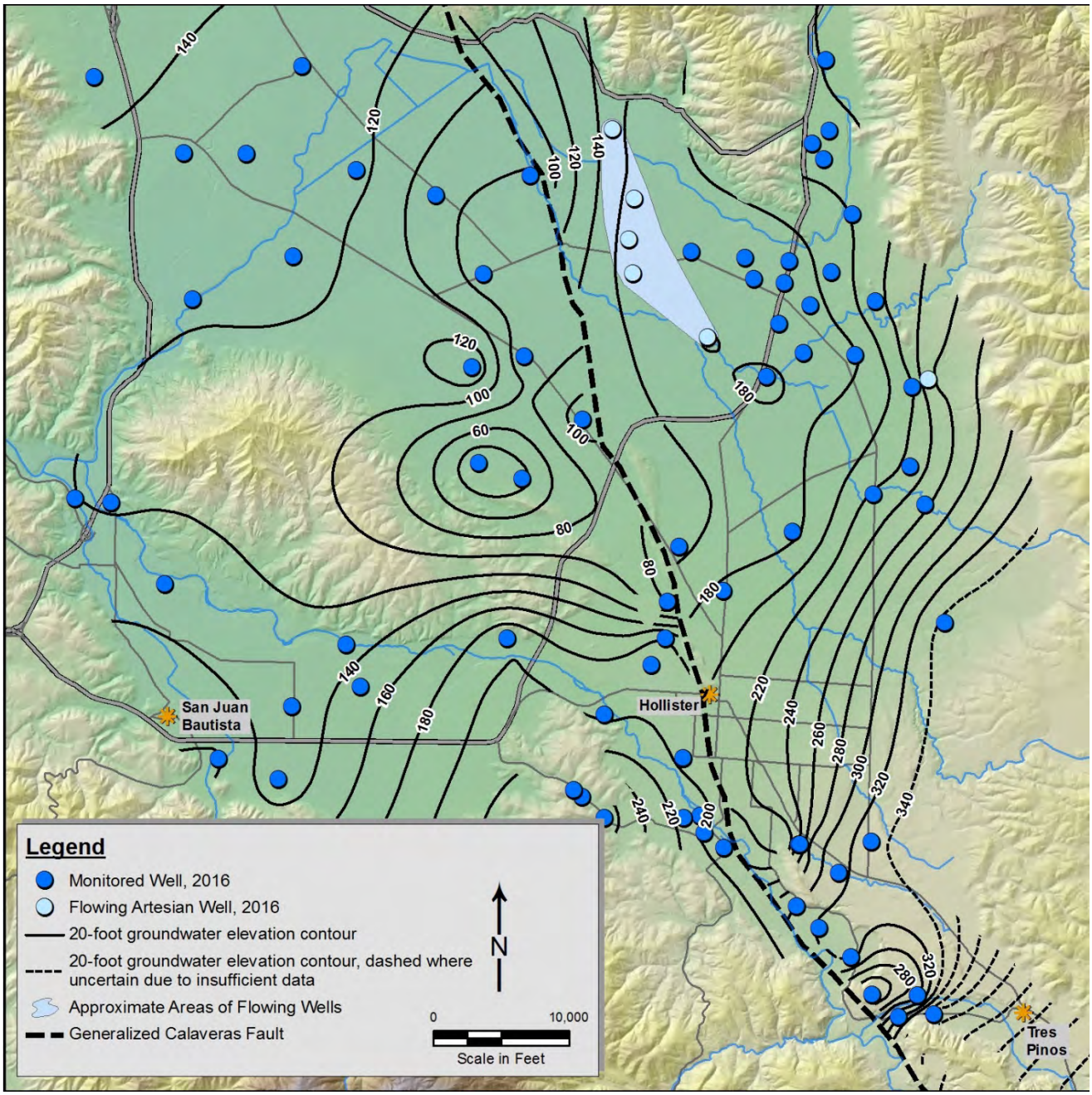
Groundwater Elevations

Groundwater elevation data were examined from 90 wells in the District's quarterly groundwater elevation monitoring program. Generally, October groundwater elevation data are used for preparing groundwater elevation contour maps. However, this year some of the measurements were collected in early November. Groundwater elevations in the fall, including those shown in **Figure 10**, are assumed to represent the lowest levels for the water year. The groundwater elevation contouring methods incorporate the effects of the Calaveras Fault on water levels by splitting the area into eastern and western portions and then generating contours for each. The resulting contours are then evaluated for consistency and reasonableness and any necessary refinements are made. The contours indicate a general flow from southeast to northwest.

Profiles of historical groundwater levels are provided in Figure C-6 in Appendix C. These profiles show groundwater levels for 2016 and 2015 plus historic groundwater lows and the range of historical water levels. Review of Figure C-6 indicates new historic lows in the Tres Pinos area (Profile A-A') and Bolsa (Profile B-B'). Previous annual reports (2014 and 2015) also indicated new historic lows.

Additional groundwater level data are presented in Appendix C, including maps, summary tables, and water level data.

Figure 10. Groundwater Elevations, October 2016



The relative changes in groundwater elevations from October 2015 to October 2016 are shown on **Figure 11.** The map was prepared by calculating and contouring the differences between mapped groundwater elevations for the two periods. The accuracy of this map was checked by examining water level changes in individual wells that were monitored in the fall quarter of both years. **Figure 12** shows the cumulative drawdown over the current drought (2011 through 2016). While the reduced water levels are uneven, average levels in all subbasins have decreased up to 30 feet since 2011.

In both change maps, some localized areas of apparent significant change (for example in the Bolsa) reflect available data in a single well and thereby over-emphasize groundwater level changes. Resolution of such inaccuracies would be achieved by increasing the monitoring well network and stabilizing the year-to-year measurements.

Figure 11. Change in Groundwater Elevations 2015-2016

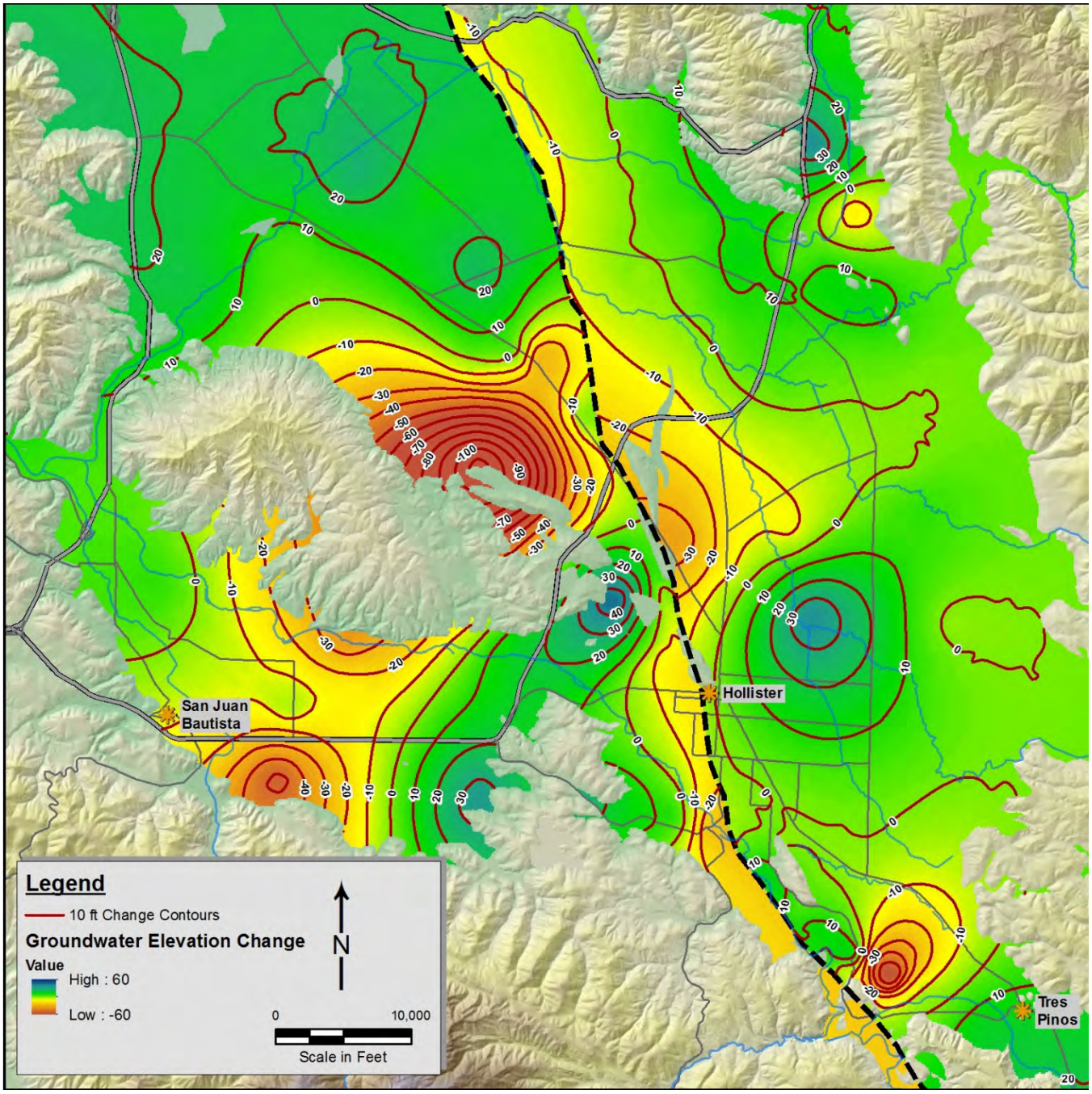
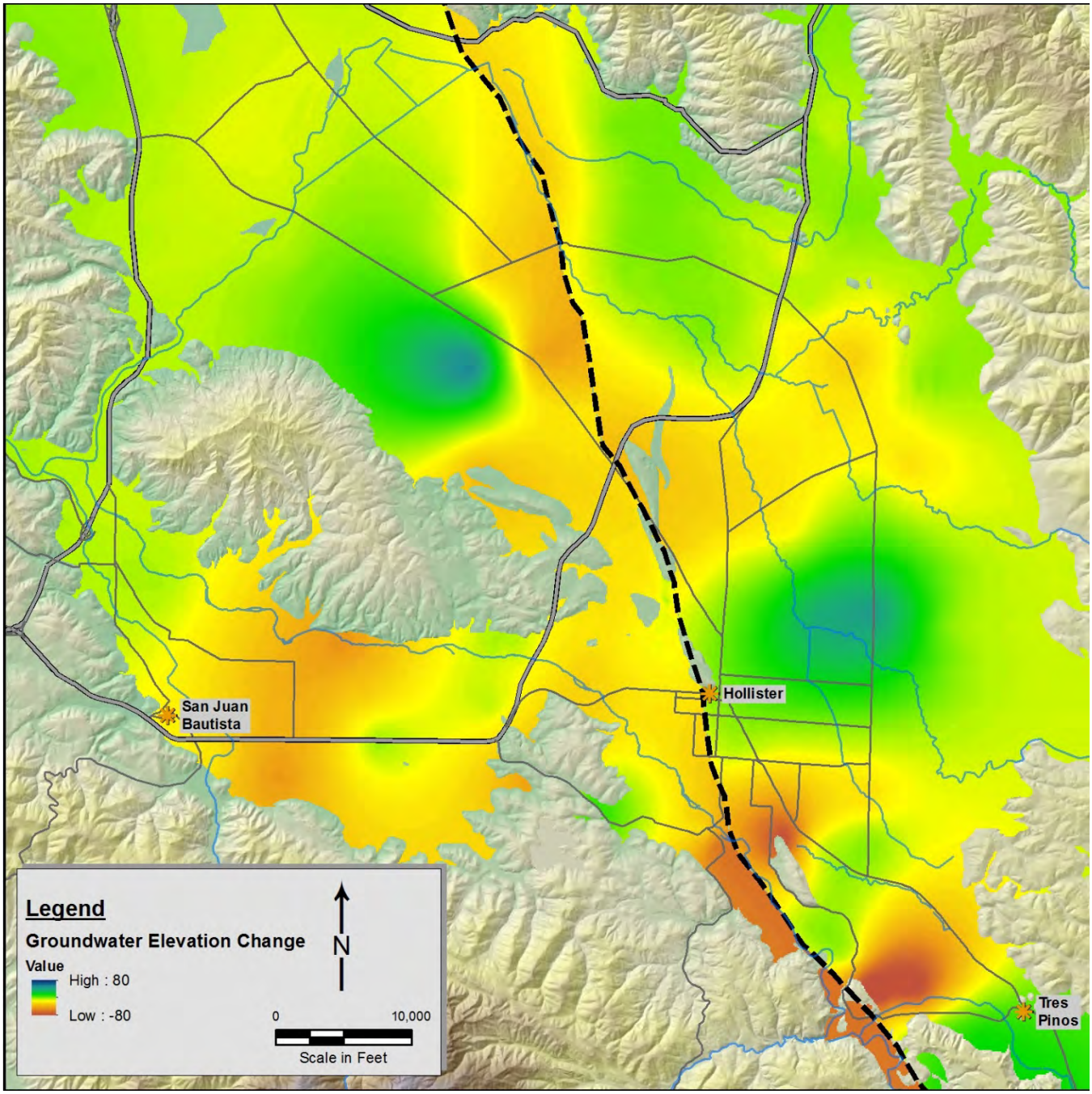


Figure 12. Cumulative Change in Groundwater Elevations 2011-2016



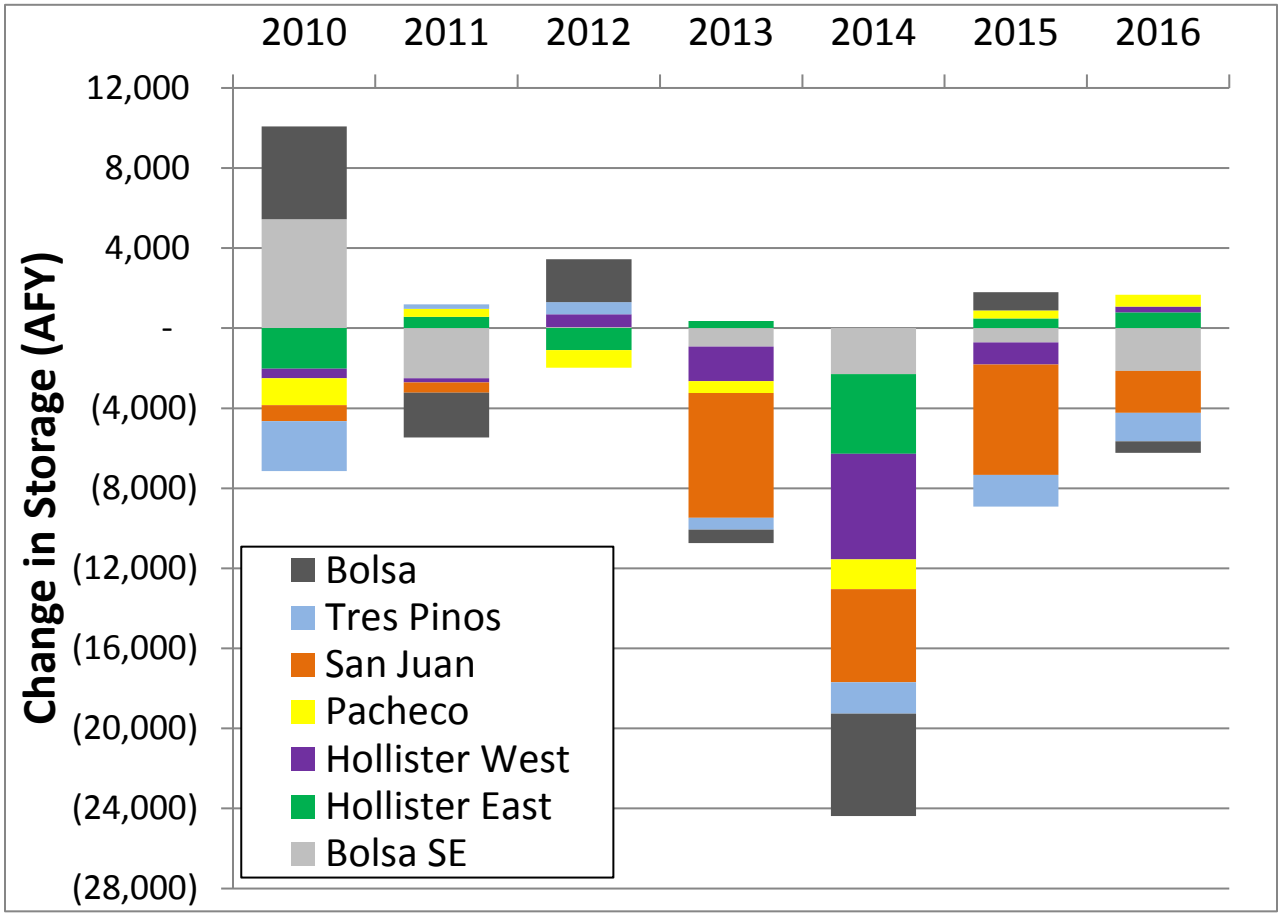
Change in Storage

Groundwater elevation changes from October 2015 to October 2016 were used to determine the change in storage, which is the net volume of water added to or removed from the basin over the water year. The change in storage was calculated using the change in groundwater elevations (feet) and multiplying by the total area (acres) to determine the total bulk volume of change. This bulk volume of change is then multiplied by the average storativity of the subbasin to represent the amount of water that a given volume of aquifer will produce. The storativity values for each subbasin were derived from a numerical model of the basin developed by Yates and Zhang (2001).

The total change in groundwater storage for Zone 6 was a decrease of 3,977 AF, while the total change for the basin, including the Bolsa subbasin, was a decrease of 4,555 AF. While recognizing that low groundwater levels can represent available capacity in the basin for future groundwater storage or banking, these ongoing large decreases in storage are significant. This marks the fourth year of significant decreased storage in San Juan. While not all subbasins showed decreased storage this year, average water levels in all subbasins continue to be well below the elevations when the current drought began in 2011. Average subbasin water levels compared to 2011 are still over 30 feet lower in Tres Pinos, nearly 27 feet lower in Bolsa SE, over 24 feet lower in Hollister West, and over 22 feet lower in San Juan. **Figure 13** illustrates the change in storage by subbasin for the past seven years.

The change in storage analysis and subsequent calculations are highly dependent on how many and which wells are monitored from year to year. As noted before, the number of monitored wells has diminished and the set of monitored wells has not been stable. This increases the uncertainty of a subbasin-wide storage change calculation because actual groundwater elevation changes cannot be effectively distinguished from apparent fluctuations related to variations in which wells are monitored. In some subbasins and some years the effects of variations in the monitoring well network have more influence on the average change in groundwater elevations than do measured differences. Stabilization of the year-to-year monitoring well network is necessary for valid assessment of change in storage.

Figure 13. Change in Storage by Subbasin (2006-2016)



Hydrographs

Long term changes in groundwater elevations are illustrated in composite hydrographs. These composite hydrographs are generated by averaging elevations from key wells from each subbasin for each monitoring event. The key well locations are shown on **Figure 14.** It should be noted that these subbasin hydrographs represent average conditions in each subbasin and illustrate long-term trends, but do not show localized variations in groundwater elevations. Overall, groundwater elevations do not indicate overdraft conditions as of 2016.

Water levels in most subbasins have shown a decrease over the multi-year drought consistent with increased pumping and decreased storage. **Figures 15a and 15b** show the composite hydrographs. While precipitation in 2016 was higher than the long-term average, it will be some time before groundwater levels recover to pre-drought levels. Some factors that will determine the length of recovery include not only precipitation but groundwater use, pattern and intensity of rainfall, local geology (that would affect how much time recharge travels from the surface to the aquifer), and any managed recharge activities (like wastewater percolation).

Figure 14. Locations of Key Wells Used in Hydrographs

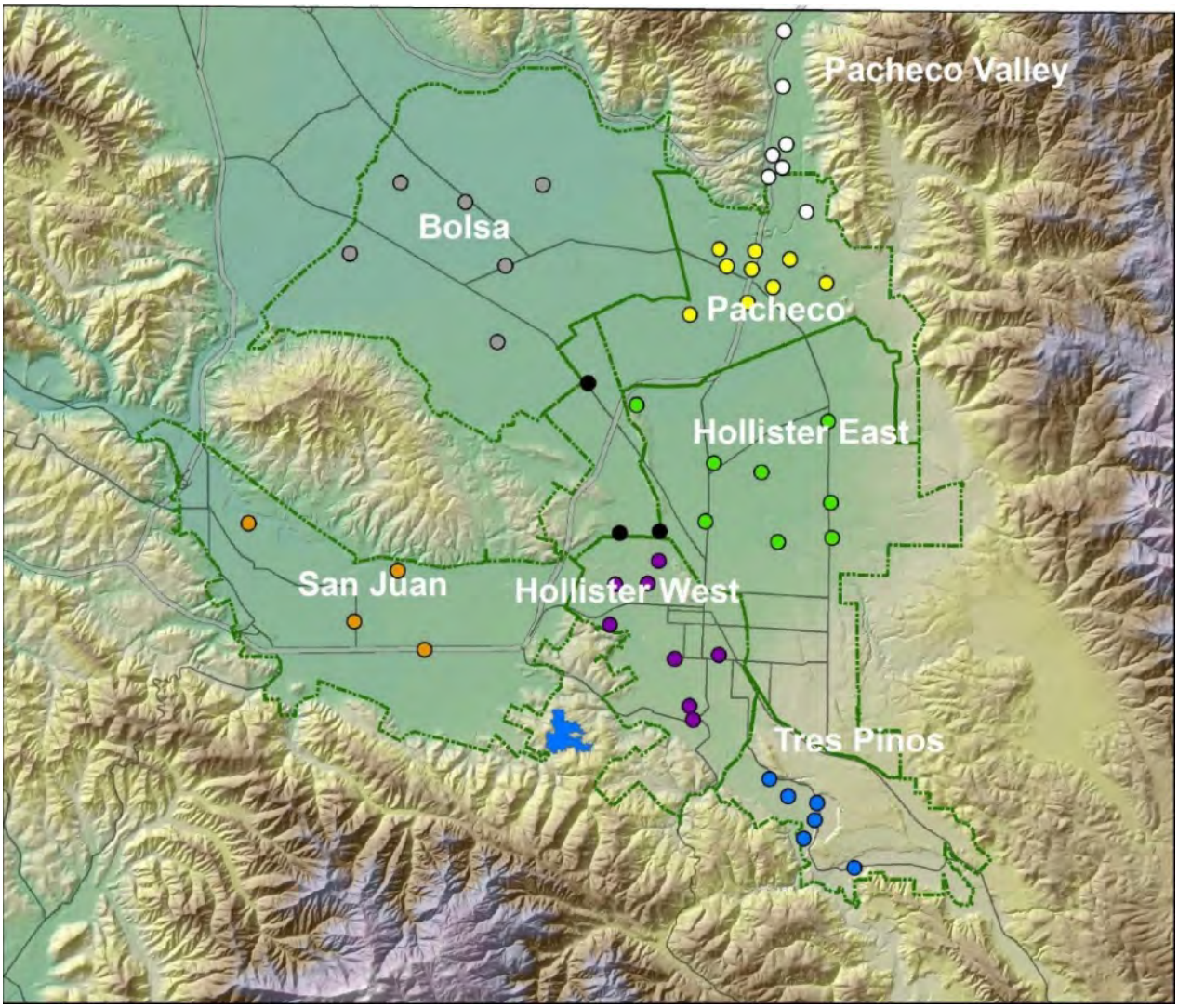
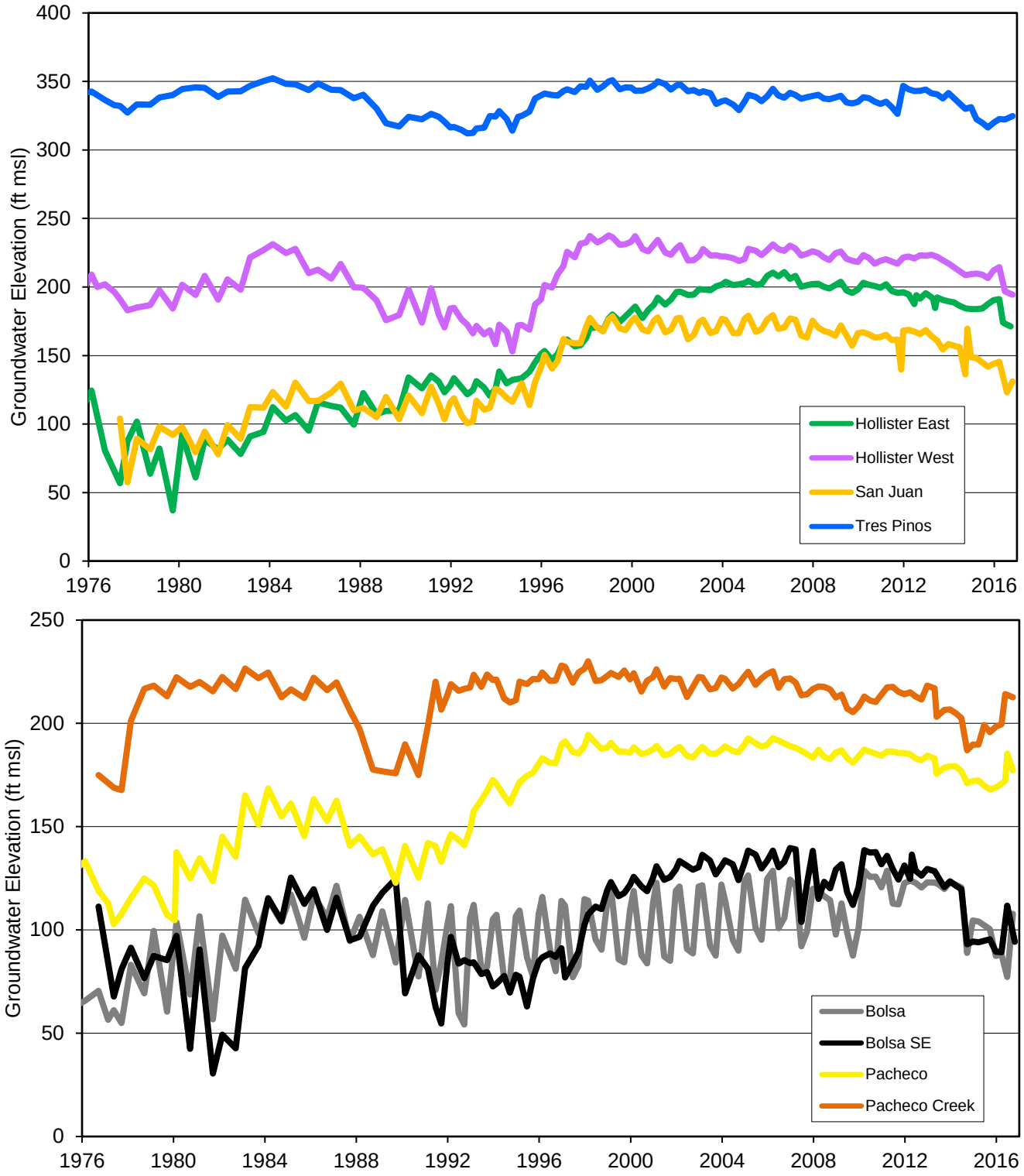


Figure 15. Composite Hydrographs



6 FINANCIAL INFORMATION

The District derives its operating revenue from charges levied on landowners and water users. Non-operating revenue is derived from property taxes, interest, standby and availability charges, and grants. Zone 6 charges relating to the importation and distribution of CVP water are the focus of this section.

The groundwater charge for Zone 6 water users reflects costs associated with groundwater monitoring and management, including the cost of purchasing CVP water and power charges associated with percolation. The per-acre-foot charge is determined by dividing these costs by the volume of groundwater usage. Groundwater charges are adjusted annually in March. For March 2016-February 2017, the District rates are $4.95 for agricultural use and a groundwater charge of $24.25 for M&I use.

The District has also calculated the groundwater charge for the next USBR water year (March 2017-February 2018). The detailed calculation is shown in Appendix F and the District recommends rates remain at $6.45 for agricultural use in Zone 6 and a groundwater charge of $24.25 is recommended for M&I use in Zone 6.

CVP rates (provided by the USBR) include the cost of service, restoration fund payment, charges for maintenance of San Luis Delta Mendota Water Authority facilities, and others fees (the breakdown is found in Appendix F). The District San Felipe rates paid by users include a standby and availability charge, power charge, and a water charge. The standby and availability charge is a $6 per-acre charge assessed on all parcels with access to CVP water (an active or idle turnout from the distribution system). Power charges depend on the location of user. **Table 8a and b,** on the following page, shows the District San Felipe water and power charges, respectively, for the Water Years 2016-2017 and 2017-2018.

Table 8a. District San Felipe Water Charges 2016-2017 and 2017-2018

Blue Valve Water Charge ($/af)				
Year	Agricultural			Municipal & Industrial
	Non - Full Cost	Full Cost (1a)	Full Cost (1b)	
2016-2017	$272.00	$445.00	$463.00	$363.00
2017-2018	$272.00	$445.00	$463.00	$363.00

Table 8b. District San Felipe Power Charges 2016-2017 and 2017-2018

Blue Valve Power Charge ($/acre-foot)	2016-2017	2017-2018
Subsystem 2	$123.10	$126.80
Subsystem 6H	$75.65	$77.90
Subsystem 9L	$109.95	$113.25
Subsystem 9H	$162.55	$167.45
All other subsystems	$66.05	$68.05

Notes:

1 "Full-cost rates for agricultural users apply to landholders that have exceeded his/her or its non full-cost entitlement. There are two full-cost rates:

a. Section 202(3) - the lower full-cost rate, which applies to qualified recipients leasing in excess of their 960-acre entitlement, limited recipients that received Reclamation irrigation water on or before October 1, 1981, and extended recordable contracts.

There are currently no Zone 6 full-cost users under this section.

b. Section 205(a)(3) - the higher full-cost rate, which applies to prior law recipients leasing in excess of their applicable no full-cost entitlement, and limited recipients that did not receive Reclamation irrigation water on or before October 1, 1981.

See Section 202(3) or 205(a)(3) of RRA Rules and Regulations for further non full-cost definitions.

Recycled Water rates (**Table 9)** were set through 2017 to recover current operating and maintenance costs related to the water service. Recycled water rates include those costs associated with water supply, water quality and infrastructure (SBCWD February 2015).

Table 9. Recycled Water Charges, 2016-2017

Recycled Water		
Effective	**Agriculture Rate**	**Power Charge**
3/1/2016	$182.55	$57.70
3/1/2017	$183.45	$59.45

Minimum Annual Purchase of water for each parcel is $700

Assuming that the District becomes a GSA and prepares a GSP, compliance with SGMA will entail increased costs for operation and maintenance; the District should explore the financial measures to support SGMA compliance equably across the managed subbasins.

7 OUTLOOK

La Niña

The next water year is expected to be a weak La Niña year, and the National Weather Service (NWS) is predicting that precipitation will be normal for Northern California, for most of the winter and spring (NWS 2016). Even average precipitation will aid in the replenishment of the groundwater basins and perhaps translate to higher CVP allocations. A return to normal rainfall alone is unlikely to end the drought.

CVP Deliveries

The annual allocation of CVP water remains uncertain. In past years, San Luis & Delta Mendota Water Authority (SLDMWA) has forecasted CVP allocation for the next year. SLDWMA no longer publishes estimated allocation in the fall. Many factors affect the allocation, including environmental considerations in the Delta, seniority of CVP water rights on water ways, reduced snowpack due to climate change, debt to the State Water Project System and other factors. The District must continue to use their existing tools (and continue to develop new management tools) to secure a reliable water supply despite variable CVP allocations.

Groundwater

In 2016, groundwater storage was reduced significantly in parts of the basin due to increased groundwater use in a context of years of extreme drought and reduced CVP allocations. Years of abundant rainfall and restored CVP supply will be needed to replenish the groundwater.

Current groundwater storage is sufficient to accommodate water demand in the short term with negative water budgets, and the capacity for groundwater recovery in subsequent wet years is sufficient to balance moderate increases in groundwater pumping without causing long-term overdraft. However, persistence of drought and reduced CVP supply entail a real risk of overdraft.

8 RECOMMENDATIONS

The water supply outlook for 2016 is mixed. While precipitation is expected to be average, the state's and the basin's water resources need to be replenished. The District should continue to move forward with plans and projects to ensure a more sustainable water supply system that includes a portfolio of sources.

Groundwater Sustainability. It is recommended the District assume the responsibilities of a Groundwater Sustainability Agency and prepare a groundwater sustainability plan for the subbasins of the Gilroy-Hollister Basin in San Benito County. Where portions of a basin overlap neighboring jurisdictions, it is recommended that the District work with the respective agency toward collaborative compliance with SGMA.

The next major milestone is establishment of a Groundwater Sustainability Agency; the deadline is June 30, 2017. It is recommended that the District begin the process as soon as possible; this would provide time to resolve unforeseen issues and, once completed, allow the District to consider next steps, such as acquisition of funding.

Groundwater Charges. Based on the methodology used since 2006, the groundwater charge for the USBR contract year (March 2017-February 2018) is recommended to be $6.45 for agricultural use in Zone 6 and a groundwater charge of $24.25 is recommended for M&I use in Zone 6.

G**roundwater Production and Replenishment.** District percolation operations helped reverse historical overdraft and then accumulated a substantial water supply reserve. The District currently manages groundwater storage and surface water to minimize excessively high or low water levels on a temporal and geographic basis. In 2016, it is recommended—insofar as possible—that storage in Hernandez Reservoir be replenished as much as possible. Percolation of available local water supplies should be focused on portions of the basin with groundwater level decline, like San Juan and Hollister West. Both subbasins are along San Benito River and would benefit from increased reservoir releases and recharge.

Groundwater Monitoring. The number of wells in both the water level network and water quality network has declined over time. It is recommended that the District assess the monitoring network and redouble efforts to monitor a stable network of wells on a regular basis. If for some reason wells are no longer part of the network, they should be replaced as soon as possible with a nearby, comparably-constructed well that can serve as a permanent addition to the network.

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A REPORTING REQUIREMENTS AND SPECIAL TOPICS

The San Benito County Water District Act (1953) is codified in California Water Code Appendix 70. Section 70-7.6 authorizes the District Board of Directors to require the District to prepare an annual groundwater report; this report addresses groundwater conditions of the District and its zones of benefit for the water year, which begins October 1 of the preceding calendar year and ends September 30 of the current calendar year. The Board has consistently ordered preparation of Annual Reports, and the reports have included the contents specified Section 70-7.6:

- An estimate of the annual overdraft for the current water year and for the ensuing water year
- Information for the consideration of the Board in its determination of the annual overdraft and accumulated overdraft as of September 30 of the current year
- A report as to the total production of water from the groundwater supplies of the District and its zones as of September 30 of the current year
- Information for the consideration of the Board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the District and its zones
- The amount of water the District is obligated to purchase during the ensuing water year
- A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the District and its zones during the ensuing water year
- A recommendation as to whether or not a groundwater charge should be levied in any zone(s) of the District in the ensuing water year and if so, a rate per acre-foot for all water other than agricultural water for such zone(s)
- Any other information the Board requires.
- The full text of Appendix 70, Section 70-7.6 through 7.8 is enclosed at the end of this appendix.
- Each water year a special topic is identified for further consideration. These topics have included water quality, salt loading, shallow wells, and others. Additional analyses and documentation provided in previous annual reports are summarized in the following table.

Table A-1. Special Topics in Previous Annual Reports

Water Year	Additional Analyses and Reporting
2000	Methodology to calculate water supply benefits of Zone 3 and 6 operations
2001	Preliminary salt balance
2002	Investigation of individual salt loading sources
2003	Documentation of nitrate in supply wells, drains, monitor wells, San Juan Creek
2004	Documentation of depth to groundwater in shallow wells
2005	Tabulation of waste discharger permit conditions and recent water quality monitoring results
2006	Rate study
2007	Water quality update
2008	Water budget update
2009	Water demand and supply
2010	Water quality update
2011	Water budget update
2012	Land use update
2013	Water quality update
2014	Water balance update and Groundwater Sustainability
2015	Groundwater Sustainability – Basin Boundaries and GSAs
2016	Water quality update

Water Code Appendix 70 Excerpts

Section 70-7.6. Groundwater; investigation and report: recommendations San Benito County

Sec. 7.6. the board by resolution require the district to annually prepare an investigation and report on groundwater conditions of the district and the zones thereof, for the period from October 1 of the preceding calendar year through September 30 of the current year and on activities of the district for protection and augmentation of the water supplies of the district and the zones thereof. The investigation and report shall include all of the following information:

(a) Information for the consideration of the board in its determination of the annual overdraft.

(b) Information for the consideration of the board in its determination of the accumulated overdraft as of September 30 of the current calendar year.

(c) A report as to the total production of water from the groundwater supplies of the district and the zones thereof as of September 30 of the current calendar year.

(d) An estimate of the annual overdraft for the current water year and for the ensuing water year.

(e) Information for the consideration of the board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the district and the zones thereof for the ensuing water year.

(f) The amount of water the district is obligated to purchase during the ensuing water year.

(g) A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the district and the zones thereof the ensuing water year.

(h) A recommendation as to whether or not a groundwater charge should be levied in any zone or zones of the district during the ensuing year.

(i) If any groundwater charge is recommended, a proposal of a rate per acre-foot for agricultural water and a rate per acre-foot for all water other than agricultural water for such zone or zones.

(j) Any other information the board requires.

(Added by Stats. 1965,c. 1798,p.4167, 7. Amended by Stats.1967,c.934, 5, eff. July27,1967; Stats. 1983, c. 402, 1; Stats. 1998, c. 219 (A.B.2135), 1.)

Section 70-7.7. Receipt of report; notice of hearing; contents; hearing

Sec. 7.7. (a) On the third Monday in December of each year, the groundwater report shall be delivered to the clerk of the board in writing. The clerk shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of a public hearing to be held on the second Monday of January of the following year in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding the groundwater report shall be held. The notice shall include, but is not limited to, an invitation to all operators of water producing facilities within the district to call at the offices of the district to examine the groundwater report.

(b) The board shall hold, on the second Monday of January of each year, a public hearing, at which time any operator of a water-producing facility within the district, or any person interested in the condition of the groundwater supplies or the surface water supplies of the district, may in person, or by representative, appear and submit evidence concerning the groundwater conditions and the surface water supplies of the district. Appearances also may be made supporting or protesting the written groundwater report, including, but not limited to, the engineer's recommended groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4167, 8. Amended by Stats. 1983, c. 02,2; Stats. 1998, c. 219 (A.B.2135,2.)

Section 70-7.8. Determination of groundwater charge; establishment of rates; zones; maximum charge; clerical errors

Sec. 7.8. (a) Prior to the end of the water year in which a hearing is held pursuant to subdivision (b) of Section 7.7, the board shall hold a public hearing, noticed pursuant to Section 6061 of the government Code, to determine if a groundwater charge should be levied, it shall levy, assess, and affix such a charge or charges against all persons operating groundwater- producing facilities within the zone or zones during the ensuing water year. The charge shall be computed at fixed and uniform rate per acre-foot for agricultural water, and at a fixed and uniform rate per acre-foot for all water other than agricultural water. Different rates may be established in different zones. However, in each zone, the rate for agricultural water shall be fixed and uniform and the rate for water other than agricultural water shall be fixed and uniform. The rate for agricultural water shall not exceed one-third of the rate for all water other than agricultural water.

(b) The groundwater charge in any year shall not exceed the costs reasonably borne by the district in the period of the charge in providing the water supply service authorized by this act in the district or a zone or zones thereof.

(c) Any groundwater charge levied pursuant to this section shall be in addition to any general tax or assessment levied within the district or any zone or zones thereof.

(d) Clerical errors occurring or appearing in the name of any person or in the description of the water-producing facility where the production of water there from is otherwise properly charged, or in the making or extension of any charge upon the records which do not affect the substantial rights of the assesse or assesses, shall not invalidate the groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4168, 9. Amended by Stats. 1983, c. 402, 3; Stats.1983, c. 402, 3; Stats. 1998, c. 219 (A.B.2135), 3.)

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Table B-1b. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Figure B-1. Annual Precipitation in Hollister

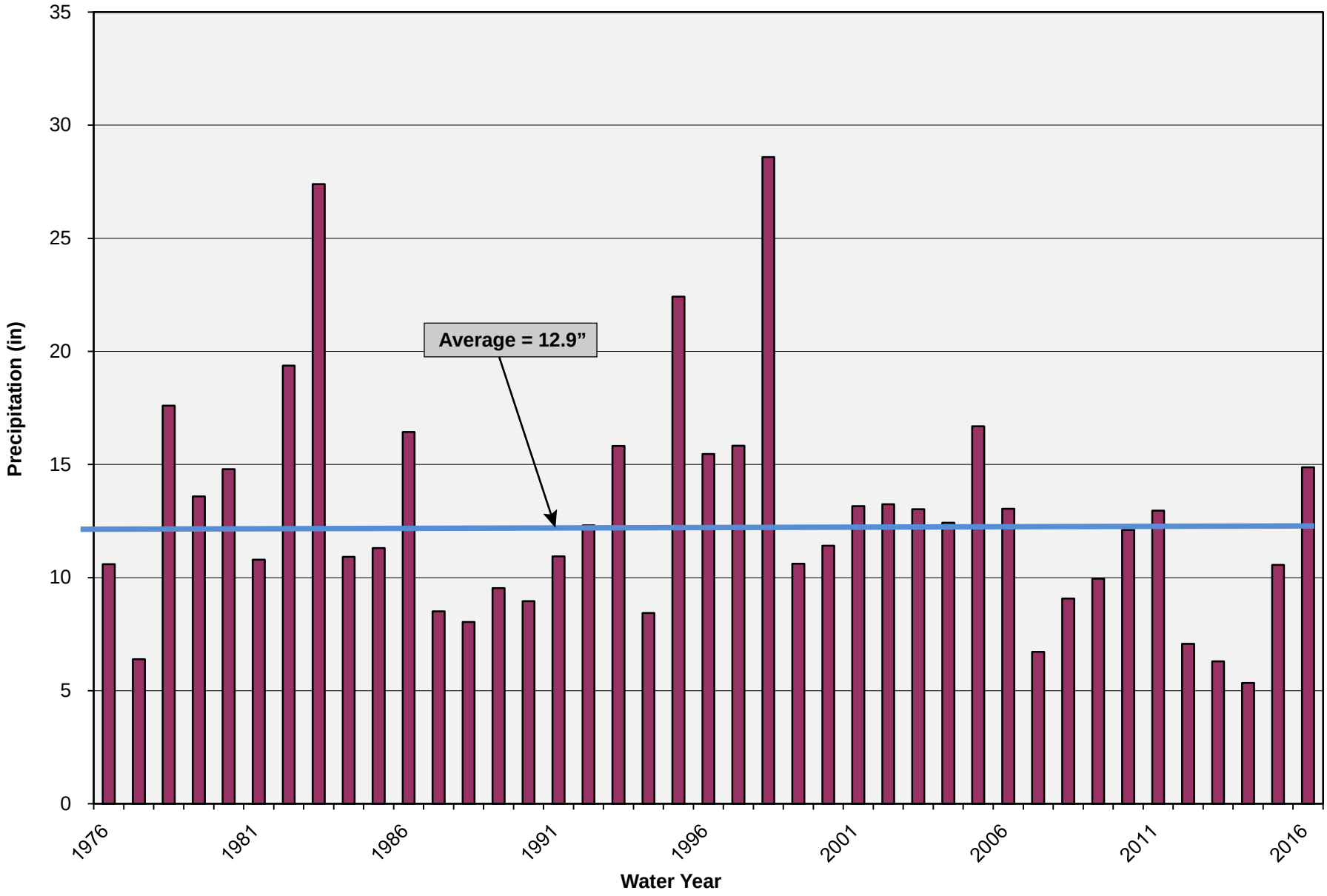
Table B-1a. Monthly Precipitation at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	0.1	0	2.2	4.4	4.5	1.6	1.3	1.3	0	0	0	0	**15.5**	**32%**
1997	1.0	3.2	4.3	6.8	0.2	0.1	0.2	0	0.1	0	0	0	**15.9**	**122%**
1998	0.2	3.8	2.6	4.9	9.1	2.7	2.3	2.4	0.1	0	0	0.1	**28.1**	**216%**
1999	0.5	1.9	0.8	2.5	2.5	1.5	0.7	0.1	0.1	0	0	0	**10.6**	**81%**
2000	0.1	1.0	0.1	4.1	4.5	0.7	0.4	0.5	0.1	0	0	0	**11.5**	**88%**
2001	3.5	0.8	0.2	2.9	2.8	0.6	2.2	0	0	0	0	0	**13.1**	**100%**
2002	0.7	11.5	11.9	0.7	1.2	1.6	0.4	0.3	0	0	0	0	**28.1**	**216%**
2003	0.0	1.7	5.0	0.8	1.4	1.1	3.1	0.1	0	0	0.1	0	**13.1**	**101%**
2004	0.2	0.6	5.3	1.3	4.2	0.6	0.3	0.1	0	0	0	0	**12.5**	**96%**
2005	2.0	0.5	3.5	2.5	2.9	3.4	0.8	0.6	0.4	0	0	0	**16.7**	**128%**
2006	0.1	0.3	3.1	1.5	1.0	5.0	1.7	0.4	0	0	0	0	**13.0**	**100%**
2007	0.2	0.7	1.7	0.6	2.2	0.3	0.6	0	0	0	0	0.4	**6.7**	**52%**
2008	0.7	0.7	0.9	4.6	2.1	0.1	0.1	0	0	0	0	0	**9.1**	**70%**
2009	0.3	1.1	1.9	0.4	3.7	1.8	0.2	0.5	0	0	0	0.2	**10.0**	**76%**
2010	0.5	0	1.3	2.3	2.2	1.7	3.4	0.6	0	0	0	0	**12.1**	**93%**
2011	0.7	1.9	2.6	1.6	2.6	2.3	0.2	0.8	0	0	0	0	**13.0**	**99%**
2012	0.7	1.0	0.1	0.8	0.5	2.3	1.4	0.3	0	0	0	0	**7.1**	**54%**
2013	0.0	2.2	1.2	1.4	0.6	0.5	0.3	0.0	0	0	0	0	**6.3**	**48%**
2014	0.1	0.4	0.2	0.2	1.9	1.6	0.9	0.0	0	0	0	0	**5.4**	**41%**
2015	1.6	0.5	5.8	0.0	1.2	0.2	0.2	0.9	0.0	0.0	0.1	0.1	**10.6**	**82%**
2016	0.2	3.7	1.6	4.0	0.6	3.7	0.8	0.1	0.1	0.1	0.1	0.1	**14.9**	**115%**
AVG	**0.7**	**1.7**	**2.7**	**2.2**	**2.6**	**1.5**	**1.0**	**0.4**	**0.1**	**0.0**	**0.0**	**0.1**	**12.9**	**95%**

Table B-1b. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	3.9	2.2	1.2	1.5	1.9	3.7	5.1	6.1	6.7	7.4	6.7	4.7	**51.0**	**105%**
1997	3.8	1.8	1.4	1.4	2.5	4.3	5.8	7.5	7.1	7.2	6.7	5.7	**55.2**	**113%**
1998	3.9	1.8	1.5	1.3	1.4	2.8	4.3	4.5	5.3	6.9	6.8	4.7	**45.2**	**93%**
1999	3.5	1.7	1.5	1.5	1.8	3.0	4.7	5.8	6.7	6.9	5.9	4.7	**47.8**	**98%**
2000	4.0	2.0	1.9	1.2	1.6	3.7	5.1	6.0	6.7	6.7	6.2	4.7	**50.0**	**103%**
2001	2.9	1.7	1.5	1.5	1.8	3.1	3.9	6.2	6.5	6.0	6.2	4.8	**46.0**	**94%**
2002	3.5	1.9	1.2	1.5	2.3	3.7	4.2	6.4	7.1	7.2	6.1	5.4	**50.5**	**104%**
2003	3.6	1.9	1.3	1.6	1.8	3.9	3.8	6.0	6.5	7.3	6.2	5.1	**48.8**	**100%**
2004	4.1	1.7	1.2	1.3	1.7	4.0	5.2	6.4	6.7	6.6	6.0	5.3	**50.3**	**103%**
2005	3.1	1.7	1.4	1.3	1.7	3.0	4.4	5.7	6.4	6.9	6.1	4.6	**46.2**	**95%**
2006	3.6	2.0	1.2	1.4	2.2	2.4	3.0	5.5	6.4	7.0	5.6	4.4	**44.7**	**92%**
2007	3.3	1.7	1.4	1.8	1.8	4.1	4.8	6.3	6.9	6.8	6.5	4.7	**49.8**	**102%**
2008	3.5	2.2	1.4	1.3	2.0	3.8	5.2	6.0	6.9	6.7	6.3	5.0	**50.2**	**103%**
2009	3.8	1.9	1.4	1.7	1.7	3.5	4.8	5.5	6.3	7.1	6.3	5.3	**49.3**	**101%**
2010	3.5	2.2	1.7	1.3	1.8	3.5	3.9	5.4	6.7	6.3	5.9	5.0	**47.0**	**96%**
2011	3.0	1.9	1.1	1.6	2.1	2.7	4.4	5.3	6.0	6.6	5.7	4.6	**45.0**	**92%**
2012	3.3	1.9	1.8	1.8	2.5	3.3	4.4	6.4	6.8	6.6	6.0	4.6	**49.5**	**101%**
2013	3.3	1.8	1.2	1.5	2.1	3.7	5.4	6.3	6.4	6.5	6.0	4.8	**48.8**	**100%**
2014	3.5	2.0	1.8	2.1	1.9	3.6	4.9	6.8	6.6	6.4	6.0	4.7	**50.4**	**103%**
2015	3.9	1.9	1.5	1.8	2.2	4.1	5.1	5.0	6.4	6.5	6.5	5.3	**50.2**	**103%**
2016	4.1	2.1	1.4	1.3	2.7	3.4	4.7	5.7	7.5	7.2	5.7	5.2	**51.0**	**105%**
AVG	3.5	1.9	1.4	1.5	1.9	3.5	4.6	6.0	6.6	6.8	6.2	4.9	**48.7**	**100%**

Note: The averages are for the available period of record, starting in 1875 for precipitation and 1995 for reference evapotranspiration.



December 2016

TODD GROUNDWATER

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Annual Precipitation in Hollister (1875 - 2015)

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Figure C-6. Profiles of Historical Groundwater Levels

Table C-1. Miscellaneous Streamflow Measurements during Water Year 2016

	Streamflow Measurement Site	Flow (cfs)				
		Oct-14	Jan-15	Apr-15	Jul-15	Oct-15
1	Tres Pinos Cr - Southside Road Bridge	0	0	0	0	0
2	San Benito River - KT Road Bridge	0	0	0	0	0
3	San Benito River - Hospital Road	0	0	0	0	0
4	San Benito River - Cienega Road	0	0	0	0	0
5	San Benito River - Nash Road	0	0	0	0	0
6	San Benito River - old Highway 156	0	0	0	0	0
7	San Benito River - near Flint Road	0	0	0	0	0
8	San Benito River - near Mitchell Road	0	0	0	0	0
9	San Benito River - upstream of Bixby Road	0	0	0	0	0
10	San Benito River - Y Road	0	0	0	0	0
11	San Juan Creek - San Juan-Hollister Road	0	0	0	0	0
12	San Juan Creek - Highway 156	0	0	0	0	0
13	San Juan Creek - Anzar Road	0	0	0	0	0
14	San Juan Creek - 2000 ft downstream of HWY 101					
15	Pacheco Creek - Walnut Avenue	0	0	0	0	0
16	Pacheco Creek - Highway 156	0	0	0	0	0
17	Pacheco Creek - Lovers Lane	0	0	0	0	0
18	Arroyo de las Viboras - Hawkins Ranch driveway	0	0	0	0	0
19	Arroyo de las Viboras - Fairview Road	0	0	0	0	0
26	Arroyo Dos Picachos - Lone Tree Road	0	0	0	0	0
20	Arroyo Dos Picachos - Fallon Road	0	0	0	0	0
21	Arroyo Dos Picachos - Aquistapace Road	0	0	0	0	0
22	Santa Ana Creek - Fairview Road	0	0	0	0	0
23	Santa Ana Creek - Fallon Road	0	0	0	0	0
24	Tequisquita Slough - San Felipe Road	0	0	0	0	0
25	Millers Canal - 2000 ft downstream of San Felipe Lake	Locked Out	Locked Out	Locked Out	Locked Out	Locked Out
27	Pajaro River - above Millers Canal					
28	Pajaro River - Highway 25					
29	Pajaro River - below Carnadero Cr					
30	Carnadero Cr - above Pajaro River					

Notes:

See Figure C-3 for numbered site locations

~ = streamflow estimated visually or by relatively inaccurate methods (e.g., width x depth x estimated centerline surface velocity)

Sites were monitored within days in the cited month;
Most sites along any individual stream were measured on the same day.

Table C-2. Groundwater Elevations October 2015 through October 2016

Well Number	Well Depth	Depth to Top	Ground	Subbasin	Key Well	Groundwater Elevations (feet MSL)				
						Oct-15	Jan-16	Apr-16	Jul-16	Oct-16
Bolsa SE										
12-5-21Q1	500	0	260	BSE	*	67.64	68.76	69.13	110	
12-5-21Q1	500	0	260	BSE	*	70.58	71.35	70.72		67.64
12-5-22N1	372	250	265	BSE	*	86.9	89.4	90.32		85.15
Hollister East										
12-6-30E1	0	0	375	HE		349.02	351.76	352.84	348	347.41
12-6-18G1	198	70	303	HE		248.91	250.86	251.74	259.56	257.35
13-6-07D2	0	0	500	HE		335.02	335.47	336.74	335.41	335.19
12-6-07P1	147	0	266	HE		224.2	226.64	227.76	231.31	224.09
12-5-24N1	300	182	270	HE	*	188.12	190.58	191.37	167.42	
12-5-23A20	862	178	239	HE	*	185.32	187.73	188.64	179	173
12-5-22J2	355	120	250	HE	*	194.64	199.44	199.88	187.77	185.47
12-5-22C1	237	102	236	HE	*	192.87	194.74	195.62	161.95	155.02
12-5-14N1	0	0	229	HE	*	176.87	179.17	179.74		
ROSSI 1	0	0	0	HE		222.43	225.64	227.64	226.71	223.24
2317	0	0	299.5	HEN		232.86	234.34	235.64	224.61	222.71
Hollister West										
13-5-03L1	126	0	303	HW	*	223.86	226.54	229.37	208.16	206.51
12-5-27E1	175	0	270	HW	*	190.54	211.54	212.54	161.09	182.32
12-5-35N2	612	288	305	HW	*	215.87	220.24	221.67	0	0
12-5-34P1	195	153	294	HW	*	202.57	204.44	206.64	194.98	193.38
12-5-33E2	121	81	266	HW	*	191.32	197.44	201.64	196.82	195.3
13-5-10B1	0	0	305	HW	*	217.59	219.22	221.64	215.25	195.13
12-5-28J1	220	0	276	HW	*	203.59	205.59	207.88	203.78	193.97
13-5-04B	0	0	285	HW		204.82	205.12	208.14	212.86	212.75
San Justo 4 (INDART)	0	0	318	HW		254.54	256.53	256.62	272	271.64
San Justo 6 (ROSE)	0	0	338	HW		231.86	230.55	229.88	235.1	234.64
13-5-11E1	0	0	309	HW		243.61	244.34	261.63	246.05	239.04
Pacheco										
11-5-26R3	225	65	208	P	*	166.77	169.24	170.11	170.03	169.57
11-5-36M1	0	0	223	P	*	0	0	0	171.45	172.66
11-5-36C1	98	0	223	P	*	174.64	182.35	183.14	188.75	187.83
11-5-35G1	230	0	206	P	*	161.35	164.77	165.12	174.37	171.98
11-5-35Q3	0	0	203	P	*	152.44	154.24	160.64	203	160.56
12-6-06K1	260	16	260	P		259.99	259.99	0	0	260
11-5-35C1	180	0	198	P	*	155.88	156.29	157.44	164.61	169.81
12-5-03B1	128	100	182	P	*	182	0	0	0	182
12-5-01G2	300	0	215	P		172.42	174.53	174.37	177.36	176.59
12-5-02H5	128	42	210	P		165.67	167.83	166.9	172.27	169.82
12-6-06L4	235	50	248	P		212.9	212.42	211.72	214.21	213.52
12-5-02L2	170	0	202	P		179.87	180.63	181.82	187.67	185.62
11-5-26N2	232	95	198	P	*	150.62	151.65	154.56	162.68	165.38
11-6-31M2	188	155	284	P	*	200.59	203.86	204.54	221.62	215.56

Table C-2. Groundwater Elevations October 2015 through October 2016

Well Number	Well Depth	Depth to Top	Ground	Subbasin	Key Well	Groundwater Elevations (feet MSL)				
						Oct-15	Jan-16	Apr-16	Jul-16	Oct-16
San Juan										
12-4-18J1	0	0	150	SJ		116.74	119.35	121.72	120	120.32
12-5-31H1	0	0	248	SJ		187.84	187.87	188.44	0	0
12-4-17L20	0	0	140	SJ		113.64	118.54	69.64	119.85	117.76
12-4-21M1	250	0	170	SJ	*	126.59	128.53	129.35	128.5	134.65
12-4-26G1	876	240	210	SJ	*	165.88	166.24	168.73	0	128.55
12-4-34H1	387	120	199	SJ	*	132.74	137.35	138.35	117.75	130.06
RIDER BERRY	0	0	241.5	SJ		175.04	179.94	180.94	0	0
13-4-03H1	312	168	206.25	SJ		182.85	186.82	187.82	0	126.52
12-5-30H1	240	0	250	SJ		186.82	189.35	190	199.78	199.16
12-4-36D2	0	0	219	SJ		171.82	173.54	174.77	0	0
12-4-35A1	325	110	216	SJ		163.87	165.35	167.44	140.57	150.62
13-4-4A3	0	0	210	SJ		182.82	185.84	186.61	163.86	163.17
Tres Pinos										
13-5-13Q1	185	44	360	TP	*	312.83	320.12	322.88	0	0
POSEY (Ridgemark)	0	0	521	TP		331.46	329.74	330.34	0	0
LEMOS (Ridgemark)	0	0	522	TP		338.26	340.27	341.42	0	0
13-6-20K1	0	0	440	TP		422.14	425.37	427.63	407.45	0
13-6-19K1	211	0	422	TP	*	348.54	351.83	353.64	353.6	344.8
13-5-12K1	0	0	440	TP		314	0	0	0	313
13-5-13J2	180	0	375	TP	*	302.88	305.42	309.64	325.78	327.24
13-5-13H1	252	112	400	TP	*	322.52	325.74	328.52	0	0
13-5-13F1	134	30	348	TP	*	311.12	313.77	315.92	324.97	324.18
13-5-12N20	352	301	332	TP	*	300.54	302.54	304.64	284.5	303
13-5-11Q1	178	61	324	TP		231.61	266.86	267.64	0	0
13-5-14C1	0	0	365	TP		252.52	253.82	256.24	252	0
13-6-19J1	340	128	450	TP		413.89	415.79	418.92	415.85	413.34
13-5-12D4	0	0	360	TP		198	199	200	207	197
Bolsa										
11-5-31F1	515	312	159	B	*	43.64	45.11	46.44	24.08	68.58
11-4-25H1	0	0	148	B		0	0	0	57.72	86.31
11-5-27P2	331	67	185	B		0	0	0	162.33	165.05
11-5-28B1	198	125	168	B		168	0	0	0	168
11-5-21E2	220	100	155	B		155	0	0	0	155
11-5-20N1	300	0	150	B	*	87.64	89.35	89.74	45.56	72.32
11-5-28P4	140	80	165	B		165	0	0	0	165
11-5-33B1	125	0	169	B		169	0	0	0	169
12-5-06L1	0	0	177	B	*	145.74	0	0	0	143.51
12-5-05G1	500	150	175	B		103.24	102.27	103.76	0	0
12-5-05M1	0	0	175	B		59.82	0	0	0	62.51
12-5-17D1	950	314	217	B		0	0	0	39.64	32
12-5-07P1	750	360	204	B		0	0	0	0	20.25
11-4-26B1	642	149	143	B	*	0	0	0	115.08	126.79

Table C-2. Groundwater Elevations October 2015 through October 2016

Well Number	Well Depth	Depth to Top	Ground	Subbasin	Key Well	Groundwater Elevations (feet MSL)				
						Oct-15	Jan-16	Apr-16	Jul-16	Oct-16
Paicines										
SCHIELDS 4 (vineyard)	0	0	682	Paicines		627.35	630.22	0	621	623.2
RIDGEMARK 7	0	0	692	Paicines		588.26	590.21	0	628.42	627.38
RFP Vineyard 3 (FRANCHIONI)	0	0	706.67	Paicines		641.72	644.37	0	658.16	657.6
OAK HILL RANCH 1	0	0	745	Paicines		653.79	656.26	0	0	0
RIDGEMARK 5	0	0	668	Paicines		630.88	633.11	0	586.6	622.85
Pacheco Creek										
11-5-24L1	70	0	234	PC	*	174.76	176.53	177.78	204.19	206.68
11-5-24C2	165	70	249	PC	*	0	0	0	222.36	221.15
11-5-24C1	134	0	244	PC	*	0	0	0	210.72	213.26
11-5-23R2	118	43	230	PC	*	181.61	185.35	186.62	0	0
11-5-13D1	125	0	258	PC	*	209.51	212.77	213.63	219.42	221.55
11-5-25G1	225	0	244.33	PC	*	217.15	218.84	220.01	0	200.31
Tres Pinos Creek Valley										
San Justo 5 (WINDMILL)	0	0	320	TPCV		0	0	0	274.98	275
WILDLIFE CENTER 5	0	0	766	TPCV		688.74	686.26	0	686.55	702
GRANITE ROCK WELL 2	0	0	0	TPCV		306.72	308.74	309.64	0	290.61
GRANITE ROCK WELL 1	0	0	0	TPCV		282.54	281.76	281.77	284	282.7
DONATI 2	0	0	696	TPCV		637.72	636.26	0	648.47	646.37
1536	0	0	0	TCPV		280	281	284	283	278
Llagas										
11S04E08K002	0	0	178.1	SCVWD		127.1	148.55	153.12	145.03	144.05
11S04E03J002	0	0	196	SCVWD		120.42	148.23	132.8	110.55	142.27
11S04E10D004	0	0	169.9	SCVWD		121.765	146.74	144.26667	123.3267	141.24
11S04E15J002	0	0	144	SCVWD		112.25	140.03	131.8	102.325	130.82
11S04E17N004	0	0	180.1	SCVWD		0	149.23	0	143.0433	145.12
11S04E21P003	0	0	154.9	SCVWD		113.98	141.35	0	118.3	132.97
11S04E22N001	0	0	149.9	SCVWD		109.82	137.47	0	109.5933	127.95
11S04E02N001	0	0	174.9	SCVWD		119.87	145.45	130.4	98.37667	139
11S04E02D008	0	0	229	SCVWD		123.56	147.7	139.65	117.3133	142.2
11S04E32R002	0	0	140.1	SCVWD		102.02	130.93	0	107.8133	121.45

Table C-3. Groundwater Change Attributes

Subbasin	Subbasin Area (Acres)	Average Storativity
San Juan	11,708	0.05
Hollister West	6,050	0.05
Tres Pinos	4,725	0.05
Pacheco	6,743	0.03
Northern Hollister East	10,686	0.03
Southern Hollister East	5,175	0.03
Bolsa SE	2,691	0.08
Bolsa	20,003	0.01

Table C-4. Groundwater Change in Elevation 2006-2016 (feet)

	Average Change in Groundwater Elevation										
Subbasin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
San Juan	0.87	(4.49)	0.29	(0.75)	(1.39)	(0.89)	-	(10.66)	(7.95)	(9.45)	(3.56)
Hollister West	3.13	(1.69)	3.31	(1.43)	(1.58)	(0.66)	2.12	(5.72)	(17.41)	(3.60)	0.93
Tres Pinos	2.47	(2.34)	0.72	8.10	(10.52)	0.97	2.54	(2.48)	(6.66)	(6.68)	(6.04)
Pacheco	1.93	(4.41)	(1.36)	8.10	(6.60)	1.92	(4.36)	(2.95)	(7.37)	1.92	2.98
Northern Hollister East	3.64	(6.51)	(4.21)	10.15	(8.73)	2.72	(2.36)	1.65	(9.10)	0.76	(1.48)
Southern Hollister East	3.26	(1.46)	5.45	9.39	4.93	(1.94)	(2.18)	(1.14)	(6.87)	1.61	8.13
Bolsa SE	1.55	(6.78)	11.51	(24.80)	25.29	(11.65)	0.25	(4.27)	(10.68)	(3.34)	(9.94)
Bolsa	6.79	(3.30)	8.97	(16.86)	23.15	(11.19)	10.72	(3.37)	(25.56)	4.57	(2.89)

Table C-5. Groundwater Change in Storage 2006-2016 (acre-feet)

	Average Change in Groundwater Storage (AF)										
Subbasin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
San Juan	510	(2,626)	168	(437)	(811)	(523)	-	(6,239)	(4,653)	(5,530)	(2,086)
Hollister West	947	(510)	1,001	(431)	(477)	(198)	640	(1,730)	(5,267)	(1,090)	282
Tres Pinos	584	(553)	169	1,913	(2,485)	228	601	(586)	(1,574)	(1,579)	(1,427)
Pacheco	391	(892)	(275)	1,639	(1,335)	389	(882)	(597)	(1,490)	388	604
Northern Hollister East	1,167	(2,087)	(1,350)	3,253	(2,798)	870	(757)	528	(2,918)	242	(474)
Southern Hollister East	506	(227)	846	1,457	766	(301)	(339)	(177)	(1,067)	250	1,263
Bolsa SE	333	(1,458)	2,478	(5,338)	5,443	(2,508)	53	(918)	(2,300)	(719)	(2,139)
Bolsa	1,358	(659)	1,794	(3,372)	4,631	(2,239)	2,144	(674)	(5,112)	915	(578)

DWR Groundwater Basins

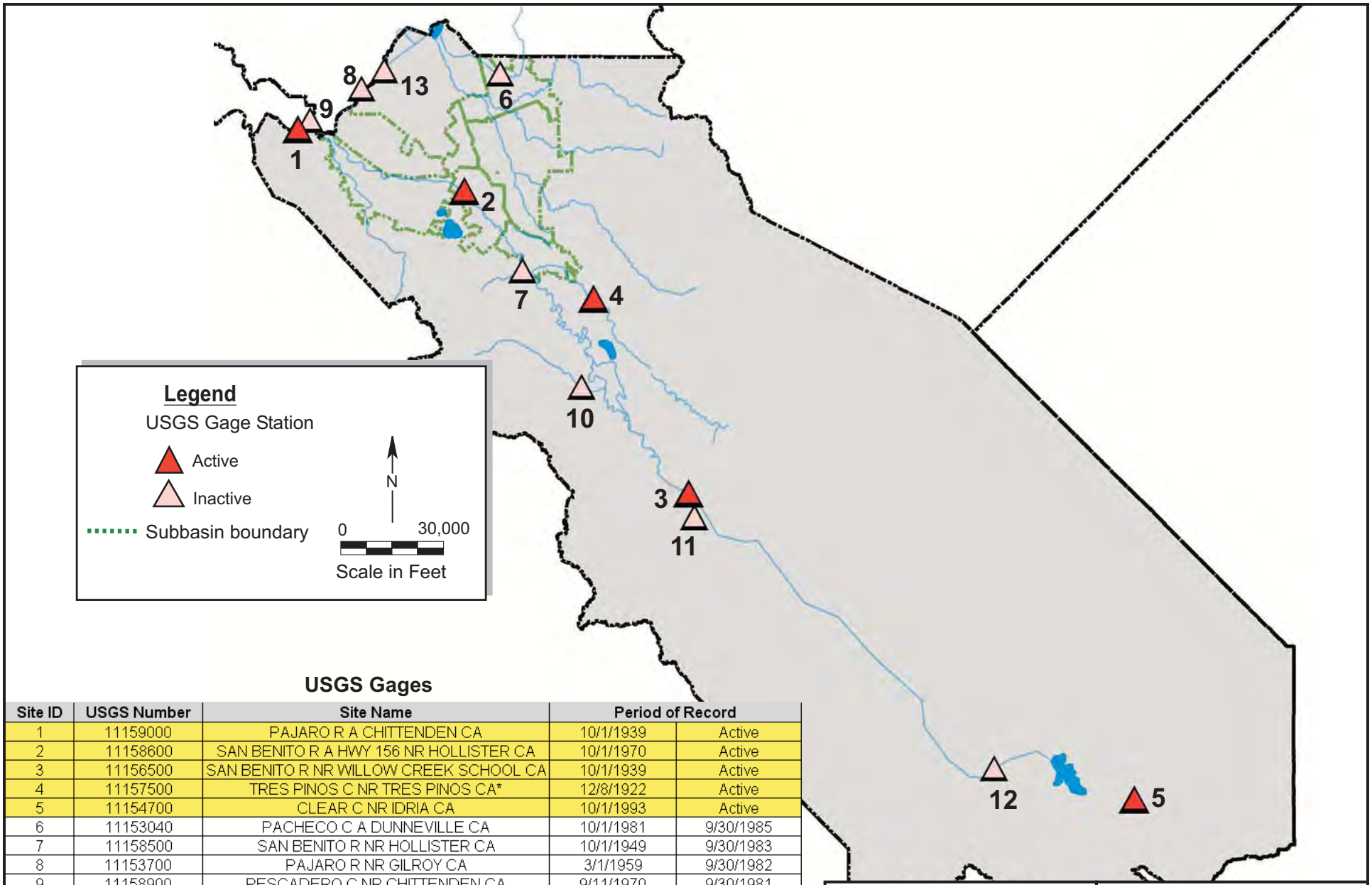
3-2 Pajaro Valley
3-3 Gilroy Hollister Valley
- 3-3.02 Bolsa Area
- 3-3.03 Hollister Area
- 3-3.04 San Juan Bautista Area

3-22 Santa Ana Valley
3-23 Upper Santa Ana Valley
3-24 Quien Sabe Valley
3-25 Tres Pinos Valley
3-28 San Benito River Valley
3-29 Dry Lake Valley
3-30 Bitter Water Valley
3-31 Hernandez Valley
5-23 Panoche Valley
5-71 Vallecitos Valley

December 2016

TODD GROUNDWATER

Figure C-1
Groundwater Basins in San Benito County



USGS Gages

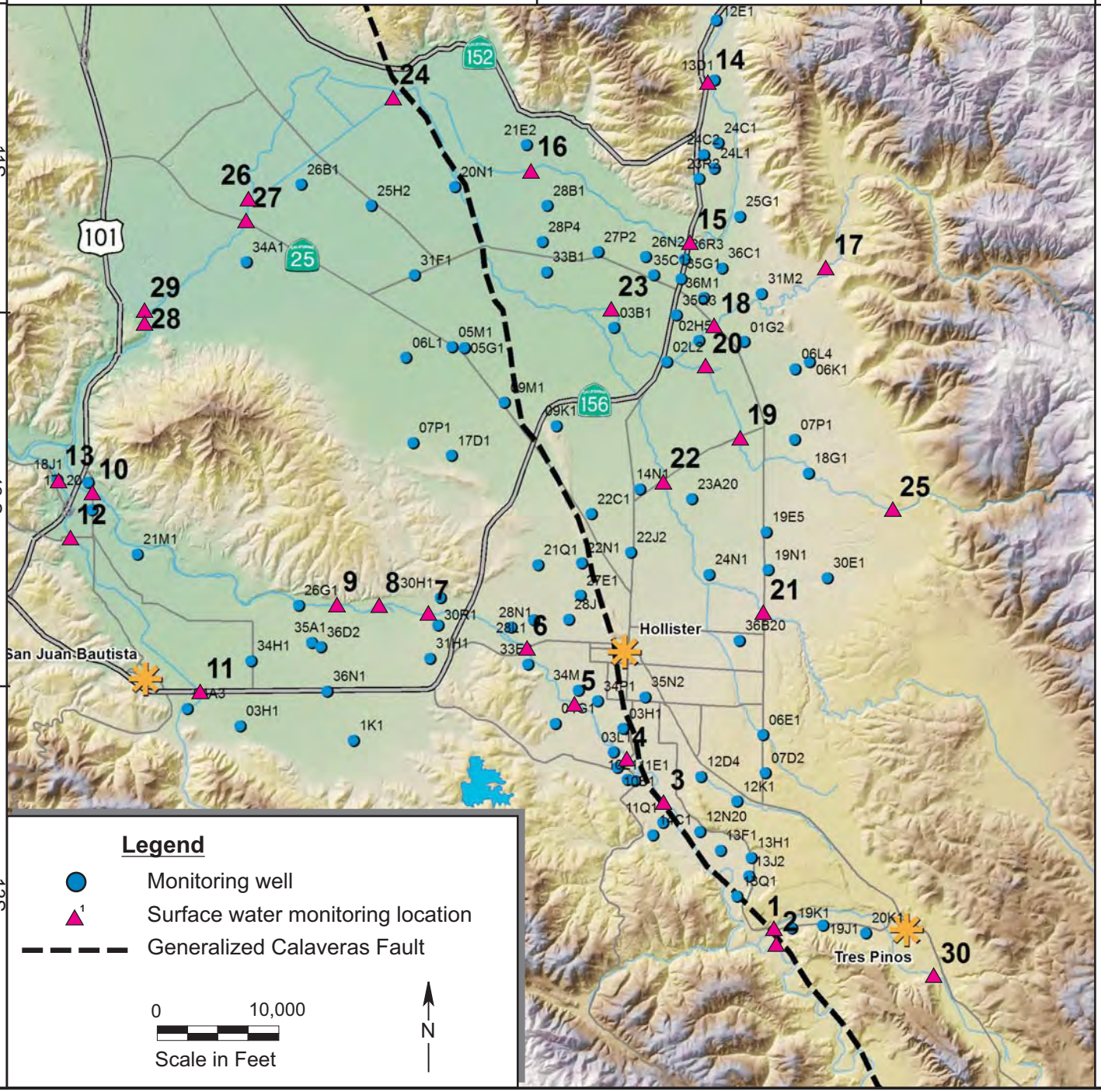
Site ID	USGS Number	Site Name	Period of Record	
1	11159000	PAJARO R A CHITTENDEN CA	10/1/1939	Active
2	11158600	SAN BENITO R A HWY 156 NR HOLLISTER CA	10/1/1970	Active
3	11156500	SAN BENITO R NR WILLOW CREEK SCHOOL CA	10/1/1939	Active
4	11157500	TRES PINOS C NR TRES PINOS CA*	12/8/1922	Active
5	11154700	CLEAR C NR IDRIA CA	10/1/1993	Active
6	11153040	PACHECO C A DUNNEVILLE CA	10/1/1981	9/30/1985
7	11158500	SAN BENITO R NR HOLLISTER CA	10/1/1949	9/30/1983
8	11153700	PAJARO R NR GILROY CA	3/1/1959	9/30/1982
9	11158900	PESCADERO C NR CHITTENDEN CA	9/11/1970	9/30/1981
10	11156700	PESCADERO C NR PAICINES CA	7/1/1959	10/7/1970
11	11156450	WILLOW C TRIB NR SAN BENITO CA	7/1/1964	9/30/1969
12	11156000	SAN BENITO R BL M C NR HERNANDEZ CA	10/1/1949	9/30/1963
13	11154500	PAJARO R A SARGENT CA	10/1/1940	9/30/1941

* WY 2006 data for gage height only

December 2016

TODD GROUNDWATER

Figure C-2
Location of Streamflow Stations



Surface Water Monitoring Locations

1. Tres Pinos Cr - Southside Road Bridge (West)
2. San Benito River - KT Road bridge
3. San Benito River - Hospital Road
4. San Benito River - Cienega Road
5. San Benito River - Nash Road
6. San Benito River - Old Highway 156
7. San Benito River - near Mitchell Road
8. San Benito River - near Flint Road
9. San Benito River - upstream of Bixby Road
10. San Benito River - Y Road
11. San Juan Creek - - Highway 156
12. San Juan Creek - Anzar Road
13. San Juan Creek - 2000 ft downstream of Highway101
14. Pacheco Creek - Walnut Avenue
15. Pacheco Creek - Highway 156
16. Pacheco Creek - Lovers Lane
17. Arroyo de las Viboras - Hawkins Ranch driveway
18. Arroyo de las Viboras - Fairview Road
19. Arroyo Dos Picachos - Fallon Road
20. Arroyo Dos Picachos - Aquistapace Road
21. Santa Ana Creek - Fairview Road
22. Santa Ana Creek - Fallon Road
23. Tequisquita Sough - San Felipe Road
24. Millers Canal - 2000 ft downstream of San Felipe Lake
25. Arroyo Dos Picachos - Lone Tree Road
26. Pajaro River - above Millers Canal
27. Pajaro River - Highway 25
28. Pajaro River - below Carnadero Creek
29. Carnadero Creek - above Pajaro River
30. Tres Pinos Creek - Bolado Park

Figure C-3
Monitoring Locations

December 2016

TODD GROUNDWATER

Path: T:\Projects\San Benito Annual 37636\2016 Annual Report\GIS\Maps\Figure C-4 - Depth to Water Map Oct 2016.mxd

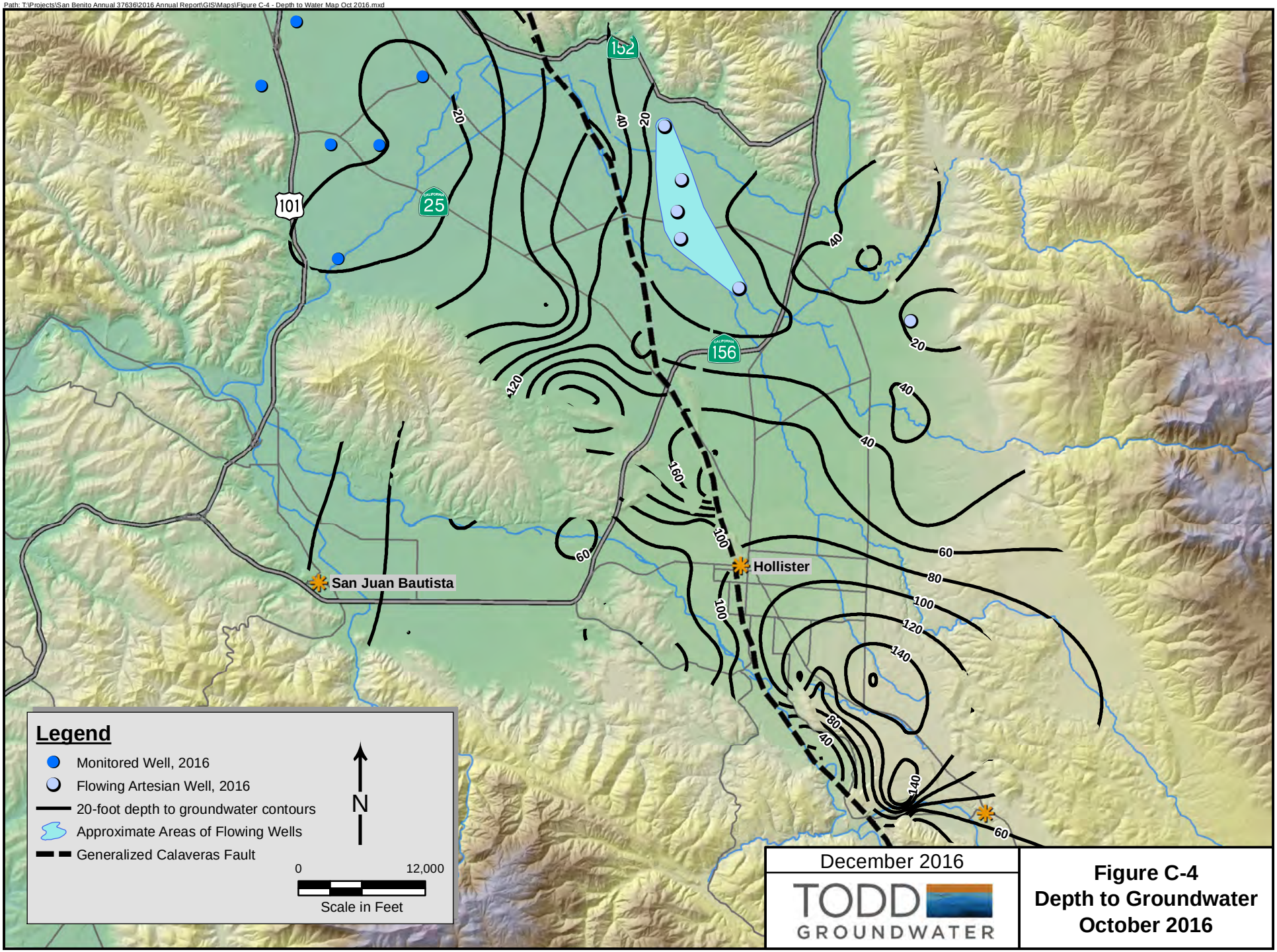


Figure C-4
Depth to Groundwater
October 2016

Path: T:\Projects\San Benito Annual 37636\2016 Annual Report\GIS\Maps\Figure C-5 Groundwater Elevation Map Oct 2015.mxd

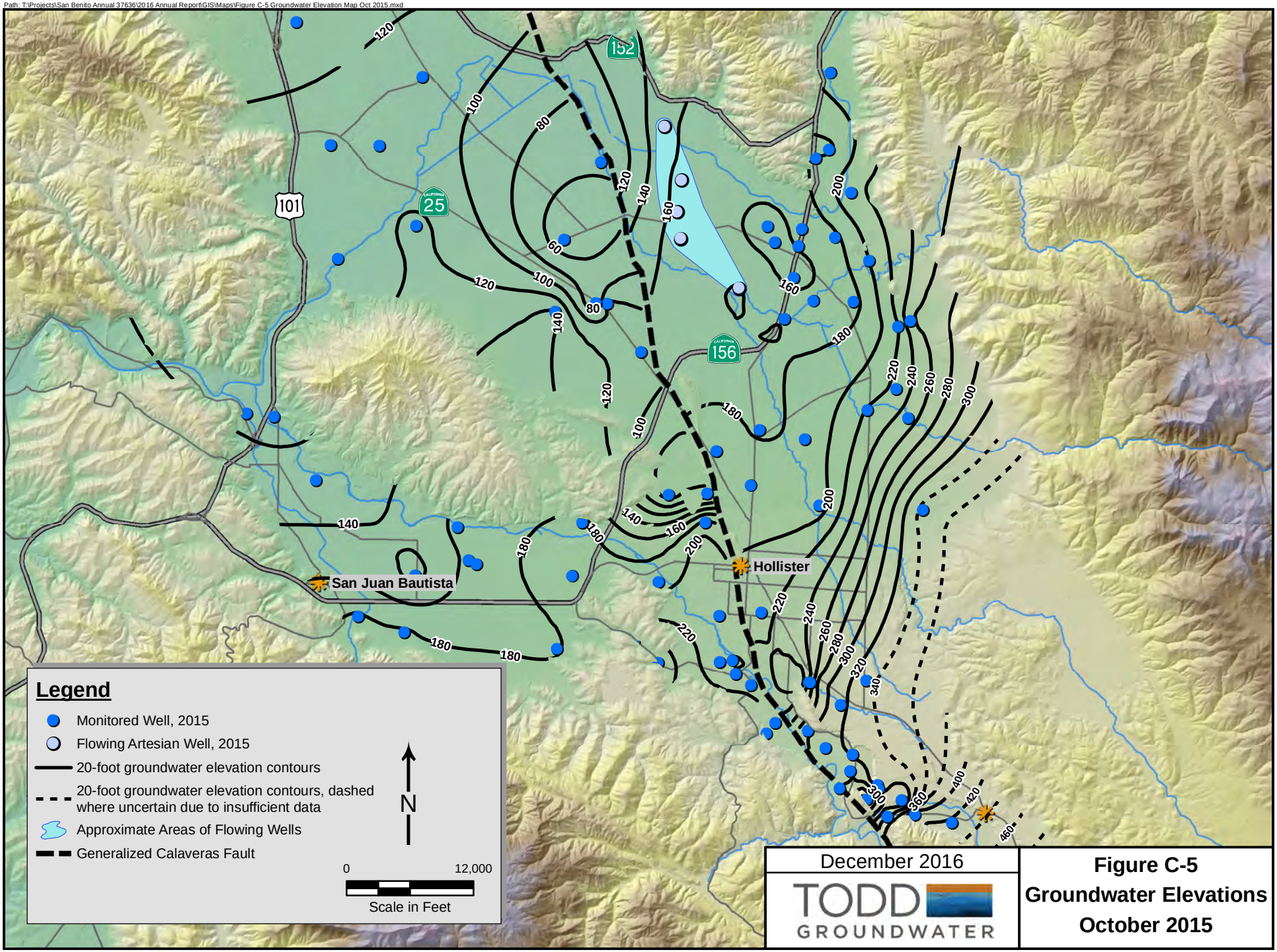
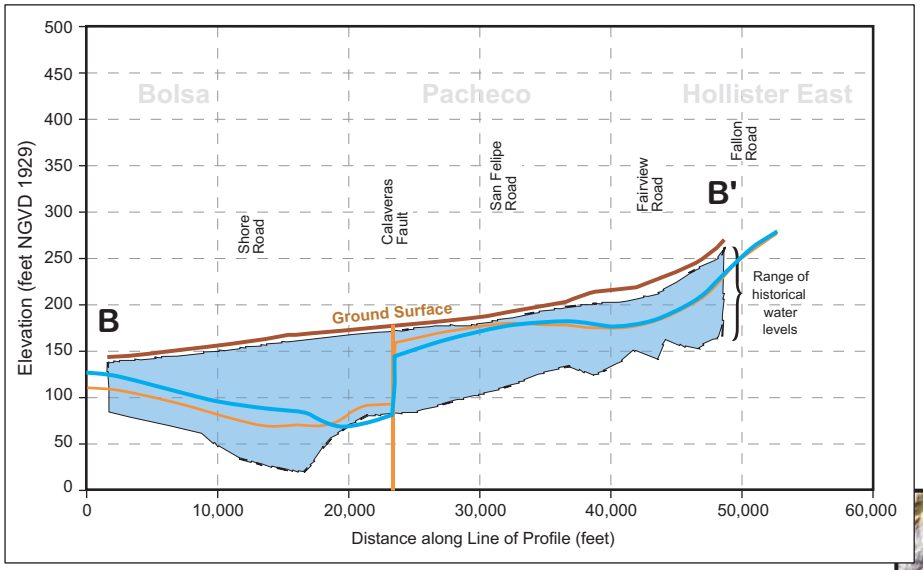
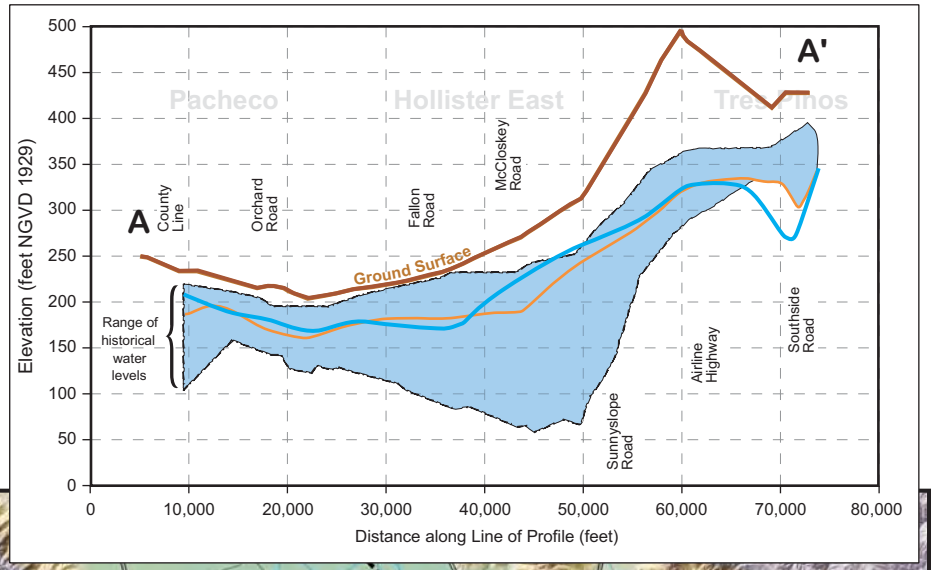
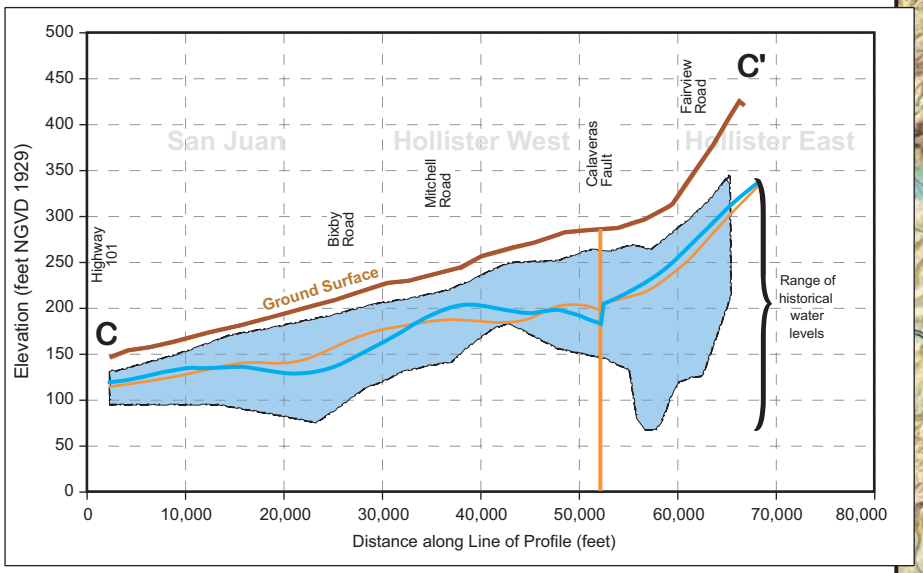
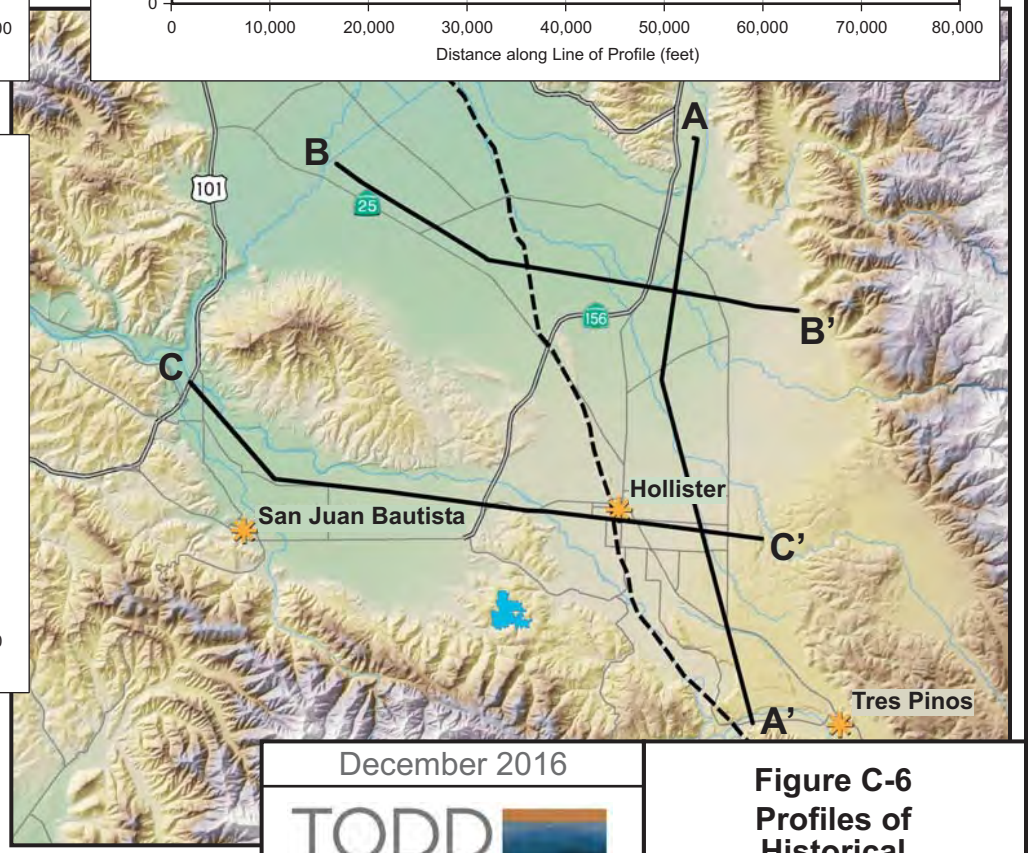


Figure C-5
Groundwater Elevations
October 2015









Legend

- Ground Surface
- Water year 2015
- Water Year 2016
- Range of Historical Water Levels

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D PERCOLATION DATA

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Figure D-2. Wastewater Percolation by WWTP

Table D-1. Reservoir Water Budgets for Water Year 2016 (acre-feet)

	Hernandez	Paicines	San Justo
Inflows			
Rainfall	32	0	180
San Benito River	350	126	n.a.
Hernandez-Paicines transfer	n.a.	0	n.a.
San Felipe Project	n.a.	n.a.	10,145
Total Inflows	**382**	**0**	**10,325**
Outflows			
Hernandez spills	0	0	0
Hernandez-Paicines transfer	0	n.a.	n.a.
Tres Pinos Creek percolation releases	0	0	n.a.
San Benito River percolation releases	-925	0	n.a.
CVP Deliveries	0	n.a.	-6,446
Evaporation and seepage	-376	n.a.	-834
Total Outflows	**-1,301**	**-126**	**-7,280**
Storage Change			
Reservoir capacity	17,200	2,870	11,000
Maximum storage	1,601	126	6,111
Minimum storage	323	0	1,834
Net water year storage change	**0**	**0**	**2,916**
Unaccounted for Water	**-144**	**0**	**-129**

Table D-2. Historical Reservoir Releases (AFY)

WY	Hernandez	Paicines	TOTAL
1996	13,535	6,139	19,674
1997	3,573	2,269	5,842
1998	26,302	450	26,752
1999	12,084	1,293	13,377
2000	13,246	2,326	15,572
2001	12,919	3,583	16,502
2002	9,698	310	10,008
2003	5,434	0	5,434
2004	3,336	0	3,336
2005	19,914	677	20,591
2006	14,112	196	14,308
2007	12,022	1,254	13,276
2008	7,646	495	8,141
2009	4,883	0	4,883
2010	8,484	4,147	12,631
2011	9,757	2,397	12,154
2012	6,341	1,321	7,662
2013	3,963	677	4,640
2014	0	0	0
2015	0	0	0
2016	925	0	925
AVG	**8,961**	**1,311**	**10,272**

Table D-3. Historical Percolation of CVP Water (AFY)

Water Year	Pacheco Creek	Arroyo de las Viboras			Arroyo Dos Picachos			Santa Ana Creek				Tres Pinos Creek	San Benito River	Total
		Road	Creek 1	Creek 2	Fallon Road	Jarvis Lane	Creek	John Smith Road	Maranatha Road	Airline Highway	Ridgemark			
1994	232	136	515	0	0	550	209	0	0	0	0	85	158	**1,885**
1995	444	238	770	2	0	654	622	73	0	0	0	809	2,734	**6,345**
1996	0	494	989	832	67	235	708	531	197	134	25	21	6,097	**10,330**
1997	0	447	601	1,981	77	0	200	17	353	286	29	1,477	5,619	**11,087**
1998	0	132	109	403	0	0	0	65	0	158	74	518	1,084	**2,543**
1999	0	0	0	0	0	0	4	256	48	141	10	452	413	**1,322**
2000	1	0	0	6	0	0	3	236	21	240	12	285	938	**1,740**
2001	0	0	0	0	0	0	0	161	17	186	1	703	1,041	**2,110**
2002	0	0	0	2	0	0	1	78	2	143	0	426	470	**1,122**
2003	0	0	0	0	0	0	5	119	9	172	0	163	605	**1,074**
2004	0	0	0	0	0	0	52	83	0	0	0	1	882	**1,018**
2005	0	0	0	0	0	0	0	0	0	0	0	0	527	**527**
2006	0	0	0	0	0	0	7	156	0	0	0	1	451	**614**
2007	0	0	0	0	0	0	0	0	0	0	0	88	216	**304**
2008	0	0	0	0	0	0	0	0	0	0	0	0	6	**6**
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Table D-4. Percolation of Municipal Wastewater during Water Year 2016

	Pond Area[1] (acres)	Effluent Discharge (acre-feet)	Evaporation[2] (acre-feet)	Percolation (acre-feet)
Hollister - domestic*	92.9	2,190	266	1,923
Hollister - industrial*	39.0	416	112	305
Ridgemark Estates I & II	7.2	174	21	154
Tres Pinos	1.8	26	5	21
Total	141	2,806	404	2,402

Notes:

1. Hollister pond areas are from Dickson and Kenneth D. Schmidt and Associates (1999) and include treatment ponds in addition to percolation ponds at the domestic wastewater treatment plant. Assumes 80% of total pond area in use at any time (Rose, pers. comm.). These areas should be updated as operations change.
2. Average evaporation less precip = 43 inches (56 in/yr evaporation (DWR Bulletin 73-79) less 13 in/yr precip (CIMIS)

The San Juan Bautista plant is not included because the unnamed tributary of San Juan Creek that receives its effluent usually gains flow along the affected reach and is on the southwest side of the San Andreas Fault. These conditions prevent the effluent from recharging the San Juan Subbasin.

Table D-5. Historical Percolation of Municipal Wastewater (AFY)

	Hollister Reclamation Plant - Domestic	Hollister - industrial	Ridgemark Estates I & II	Tres Pinos	TOTAL
1994	1,775	665	155	5	2,600
1995	1,935	610	180	10	2,735
1996	2,020	689	207	14	2,930
1997	1,965	909	201	17	3,092
1998	2,490	518	231	17	3,256
1999	1,693	1,476	156	12	3,337
2000	2,110	1,136	293	24	3,563
2001	1,742	1,078	303	24	3,147
2002	1,884	1,545	283	24	3,736
2003	2,009	1,432	279	24	3,744
2004	1,787	1,536	268	21	3,612
2005	1,891	1,323	227	26	3,468
2006	1,797	1,211	216	33	3,257
2007	1,740	1,228	139	19	3,126
2008	1,580	1,257	139	19	2,996
2009	1,976	428	172	19	2,594
2010	1,922	37	172	19	2,150
2011	1,807	466	183	19	2,476
2012	1,740	605	177	19	2,541
2013*	889	332	188	21	1,430
2014	1,552	86	179	21	1,838
2015	1,816	344	161	21	2,342
2016	1,923	305	154	21	2,402

* Hollister WW data for 2013 updated with new data

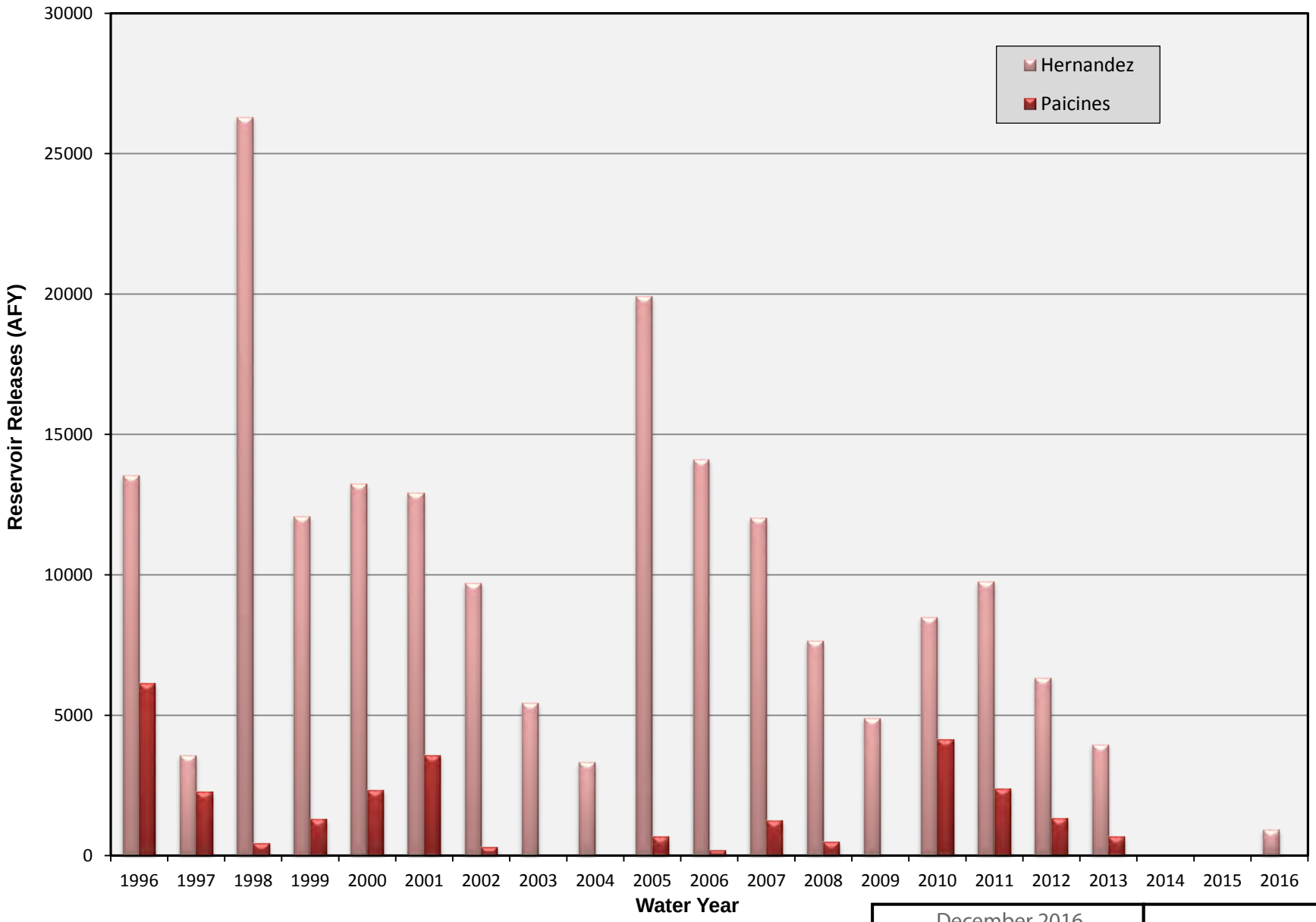

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Figure D-1
Reservoir Releases for Percolation

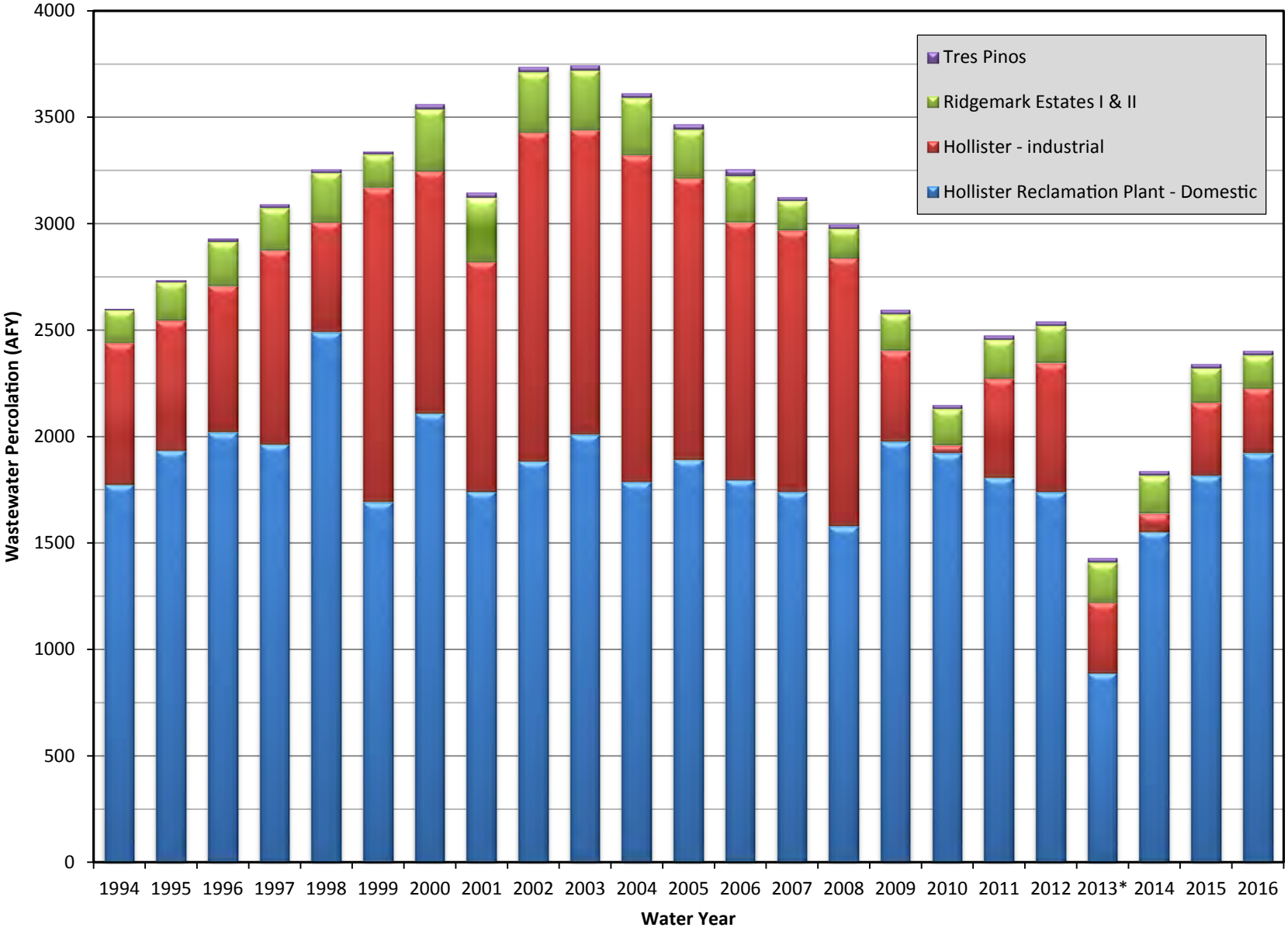

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Figure D-2
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Figure E-5. Municipal Water Use by Purveyor

Table E-1. Recent CVP Allocation and Use

	Municipal and Industrial (M&I) CVP				Agricultural CVP			
Water Year	Percent of Contract Allocation	Percent of Historic Average	Contract Amount Used (AF)	Contract Amount Used (%)	Percent of Contract Allocation	Percent of Contract and M&I Adjustment[1]	Contract Amount Used (AF)	Contract Amount Used (%)
	(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)		(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)	
2006	100%		3,152	38%	100%		19,840	56%
2007	100%		4,969	60%	40%		18,865	53%
2008	37%	75%	2,232	27%	40%	45%	10,514	30%
2009	29%	60%	1,978	24%	10%	11%	6,439	18%
2010	37%	75%	2,197	27%	45%	50%	10,061	28%
2011	100%		2,433	29%	80%		16,234	46%
2012	51%	75%	2,683	33%	40%	40%	17,267	49%
2013	47%	70%	2,652	32%	20%	22%	12,914	36%
2014	34%	50%	1,599	29%	0%	0%	7,545	21%
2015	25%	25%	1,810	22%	0%	0%	3,697	10%
2016	55%	55%	1,914	23%	5%	0%	4,434	12%

Notes:

[1] If the M&I allocation is 75 percent or less, the difference between the M&I contract amount and M&I allocation is added to the agricultural contract amount. The agricultural percentage is multiplied by that sum to obtain the agricultural allocation.

Table E-2. Historical Water Use by Subbasin and Water Source (AFY)

Subbasin	Pacheco		Bolsa Southeast			San Juan		Hollister West			Hollister East			Tres Pinos		Total Zone 6		
Source	GW	CVP	GW	CVP	RW	GW	CVP	GW	CVP	RW	GW	CVP	RW	GW	CVP	GW	CVP	RW
1993	2,251	3,210	3,474	533		9,278	4,300	7,213	90		3,744	7,275		5,658	224	31,618	15,633	-
1994	3,748	3,394	3,467	602		10,859	3,836	7,327	87		5,475	6,808		5,294	263	36,169	14,990	-
1995	2,756	3,474	2,855	720		9,328	4,554	7,092	460		3,428	6,647		4,475	275	29,935	16,130	-
1996	2,533	3,500	2,682	782		8,726	5,187	5,717	679		3,396	8,267		3,695	408	26,748	18,823	-
1997	2,209	4,205	2,755	997		9,587	6,191	7,602	907		3,534	8,284		4,620	466	30,307	21,048	-
1998	2,035	2,165	1,561	361		6,963	4,099	4,991	591		4,037	5,291		3,751	289	23,338	12,796	-
1999	2,553	3,219	2,453	433		9,312	5,990	7,013	726		3,701	7,279		4,199	391	29,231	18,038	-
2000	2,270	3,256	2,418	355		8,681	6,372	7,590	869		3,108	7,279		4,006	542	28,073	18,673	-
2001	1,848	3,443	2,126	411		7,977	7,232	7,377	685		2,213	7,010		3,599	621	25,140	19,402	-
2002	2,322	3,840	2,193	497		7,571	7,242	6,577	706		2,588	7,390		3,994	737	25,244	20,411	-
2003	2,425	3,277	2,175	493		7,434	7,127	6,222	720		1,897	9,329		2,805	788	22,958	21,734	-
2004	2,461	3,607	2,405	740		8,121	7,357	4,971	614		2,321	10,726		3,204	966	23,484	24,010	-
2005	1,320	3,106	1,849	514		6,608	6,245	5,084	680		2,586	9,198		2,378	642	19,825	20,384	-
2006	1,208	3,495	1,864	661		6,741	7,200	4,633	579		2,555	10,253		2,537	803	19,538	22,992	-
2007	1,034	3,832	2,005	572		7,658	6,160	5,118	553		3,867	10,194		2,908	804	22,590	22,115	-
2008	1,900	1,568	2,014	333		7,796	3,160	4,375	399		3,962	6,792		2,743	493	22,789	12,745	-
2009	3,370	1,257	2,082	179		11,956	1,605	4,186	19		4,733	4,697		2,871	447	29,199	8,204	-
2010	2,553	1,771	1,897	207		9,561	3,452	4,081	10	151	4,460	6,056		1,686	488	24,238	11,984	151
2011	1,992	2,420	2,781	229		4,987	5,623	3,940	394	183	1,947	9,575		2,454	427	18,102	18,667	183
2012	3,723	2,652	1,556	288		5,782	5,976	4,298	549	230	2,004	9,917		2,492	568	19,855	19,949	230
2013*	4,157	1,976	2,348	292		11,044	4,134	5,656	374	357	5,430	8,224		2,452	565	31,087	15,566	357
2014	3,303	1,020	2,157	32		10,018	1,984	7,227	233	262	4,872	5,490		3,014	384	30,592	9,144	262
2015	4,279	555	2,401	20		12,739	975	4,730	148	101	7,230	3,568		2,948	241	34,327	5,507	101
2016	4,386	420	2,558	30	38	13,581	819	4,031	162	253	6,383	4,810	207	2,223	106	33,162	6,347	499
AVG 03-16	2,722	2,211	2,149	328	38	8,859	4,415	4,897	388	220	3,875	7,774	207	2,623	552	25,125	15,668	127

GW = groundwater, CVP = Central Valley Project, RW = recycled water

* Hollister RW data updated for 2013 based on new data

Table E-3. Recent Water Use by Subbasin and User Type, not including recycled water (AFY)

SUBBASIN	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Agriculture												
Bolsa SE	2,352	2,517	2,570	2,334	2,252	2,103	3,004	1,837	2,635	2,180	2,417	2,601
Hollister East	8,543	9,526	10,685	8,012	6,860	8,315	9,067	9,453	10,832	8,151	8,464	8,784
Hollister West	2,128	1,936	2,145	1,509	1,708	1,888	2,190	2,228	3,324	2,584	2,750	2,192
Pacheco	4,190	4,469	4,573	3,220	4,304	4,242	4,279	6,148	5,990	4,121	4,658	4,616
San Juan	11,496	12,622	12,185	9,581	12,397	11,960	10,009	10,964	14,376	11,183	13,123	13,826
Tres Pinos	800	1,004	954	655	670	640	471	641	652	514	1,513	572
TOTAL	29,509	32,074	33,112	25,310	28,192	29,148	29,020	30,980	37,810	28,734	32,926	32,591
M&I												
Bolsa SE	12	8	7	13	9	0	6	6	4	9	5	25
Hollister East	3,241	3,280	3,203	2,742	2,570	2,201	2,455	2,469	2,822	2,211	2,334	2,617
Hollister West	3,636	3,168	3,361	3,265	2,710	2,477	2,144	2,619	2,705	4,876	2,128	2,254
Pacheco	235	234	293	248	323	83	133	227	144	203	176	191
San Juan	1,356	1,320	1,640	1,375	1,164	1,053	601	793	803	820	590	574
Tres Pinos	2,220	2,336	2,748	2,581	2,648	3,048	2,410	2,710	2,365	2,884	1,676	1,757
TOTAL	10,700	10,345	11,252	10,225	9,424	8,862	7,749	8,825	8,843	11,002	6,909	7,417

Table E-4. Historical Water Use by User Type (AFY)

WY	Agricultural	Municipal, and Industrial	Total	% Ag
1988	45,366	5,152	50,518	90%
1989	32,387	6,047	38,434	84%
1990	49,663	5,725	55,388	90%
1991	46,640	7,631	54,271	86%
1992	32,210	6,912	39,122	82%
1993	38,878	5,066	43,944	88%
1994	41,854	7,186	49,040	85%
1995	36,399	8,272	44,671	81%
1996	39,575	8,338	47,913	83%
1997	41,482	11,117	52,599	79%
1998	27,526	8,650	36,176	76%
1999	37,203	10,110	47,313	79%
2000	36,062	10,811	46,873	77%
2001	34,035	10,687	44,722	76%
2002	34,354	11,347	45,701	75%
2003	33,533	11,206	44,739	75%
2004	35,597	11,944	47,541	75%
2005	29,509	10,700	40,209	73%
2006	32,074	10,345	42,419	76%
2007	33,112	11,252	44,364	75%
2008	25,310	10,225	35,535	71%
2009	28,192	9,424	37,616	75%
2010	29,148	8,862	38,010	77%
2011	29,020	7,749	36,769	79%
2012	31,270	8,825	40,095	78%
2013	37,810	8,843	46,653	81%
2014	28,734	11,226	39,960	72%
2015	32,926	7,010	39,935	82%
2016	32,591	7,417	40,008	81%
AVERAGE	**34,995**	**8,952**	**43,947**	**79%**

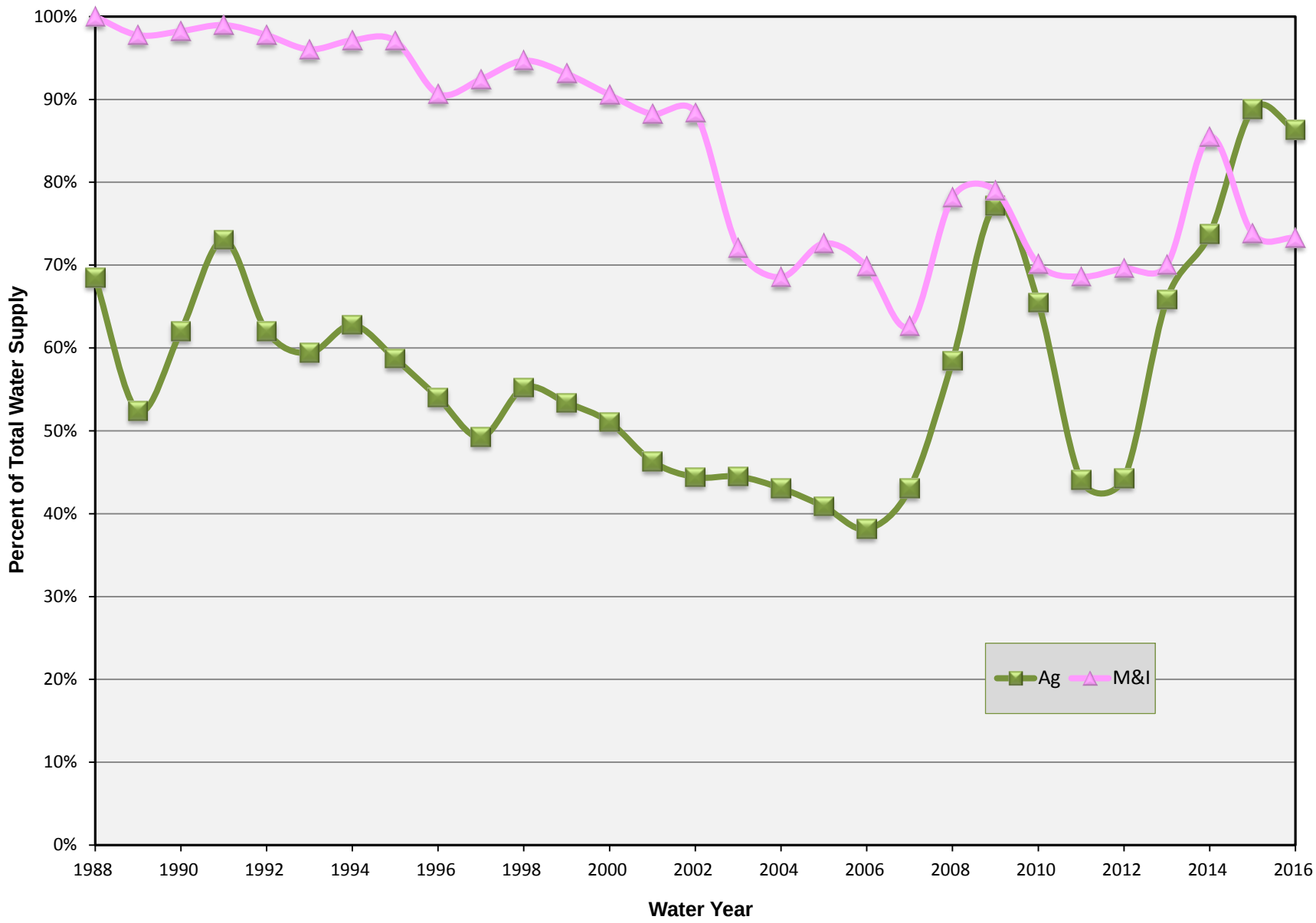
Table E-5. Municipal Water Use by Purveyor for Water Year 2016 (AF)

	WY 2016	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Groundwater													
Sunnyslope CWD	**1,331**	156	111	72	48	52	44	69	105	117	188	182	188
City of Hollister	**1,615**	137	99	87	94	84	94	115	167	198	230	230	80
City of Hollister - Cienega Wells	**105**	9	9	9	9	7	9	9	9	9	9	9	8
San Juan Bautista	**232**	20	15	15	14	14	16	16	20	25	25	26	25
Tres Pinos CWD	**49**	4	4	3	3	3	2	3	4	5	5	4	8
Groundwater Subtotal	**3,332**	**326**	**238**	**186**	**168**	**160**	**165**	**212**	**306**	**354**	**457**	**450**	**310**
CVP Imported Water													
Lessalt Treatment Plant	**1,682**	124	136	125	120	135	113	122	160	153	166	178	149
Imported Water Subtotal	**1,682**	**124**	**136**	**125**	**120**	**135**	**113**	**122**	**160**	**153**	**166**	**178**	**149**
Municipal Total													
Municipal Water Supply Total	**5,014**	**451**	**374**	**310**	**288**	**294**	**278**	**334**	**466**	**507**	**624**	**628**	**459**

Table E-6. Historical Municipal Water Use by Purveyor (AFY)

WY	Sunnyslope CWD - GW	City of Hollister - GW	City of Hollister - Cienega Wells[1]	San Juan Bautista	Tres Pinos CWD	Lessalt Treatment Plant	Undivided Total	TOTAL
1988						0	5,152	**5,152**
1989						0	6,047	**6,047**
1990						0	5,725	**5,725**
1991						0	7,631	**7,631**
1992						0	6,912	**6,912**
1993						0	5,066	**5,066**
1994						0	7,186	**7,186**
1995	2,167	2,446				0		**4,613**
1996	2,139	3,386				0		**5,525**
1997	2,638	3,848				0		**6,486**
1998	2,357	3,441				0		**5,798**
1999	2,820	3,558				0		**6,378**
2000	3,214	4,021				0		**7,235**
2001	3,290	3,851				0		**7,141**
2002	3,256	4,120				21		**7,398**
2003	2,053	2,754				2,494		**7,302**
2004	2,426	2,828				2,101		**7,356**
2005	1,959	3,147	123	247	49	1,843		**7,368**
2006	1,907	2,801	123	150	49	1,900		**6,930**
2007	2,413	2,758	123	47	49	1,719		**7,108**
2008	2,294	2,746	123	417	47	1,323		**6,949**
2009	2,251	2,503	123	373	47	1,212		**6,509**
2010	1,861	2,194	108	308	47	1,344		**5,861**
2011	2,225	1,651	80	292	47	1,593		**5,887**
2012	2,360	1,761	130	267	45	1,657		**6,219**
2013	1,655	2,655	120	281	46	1,648		**6,405**
2014	2,134	2,646	114	285	49	979		**6,207**
2015	1,348	1,960	114	225	49	1,364		**5,060**
2016	1,331	1,615	105	232	49	1,682		**5,014**

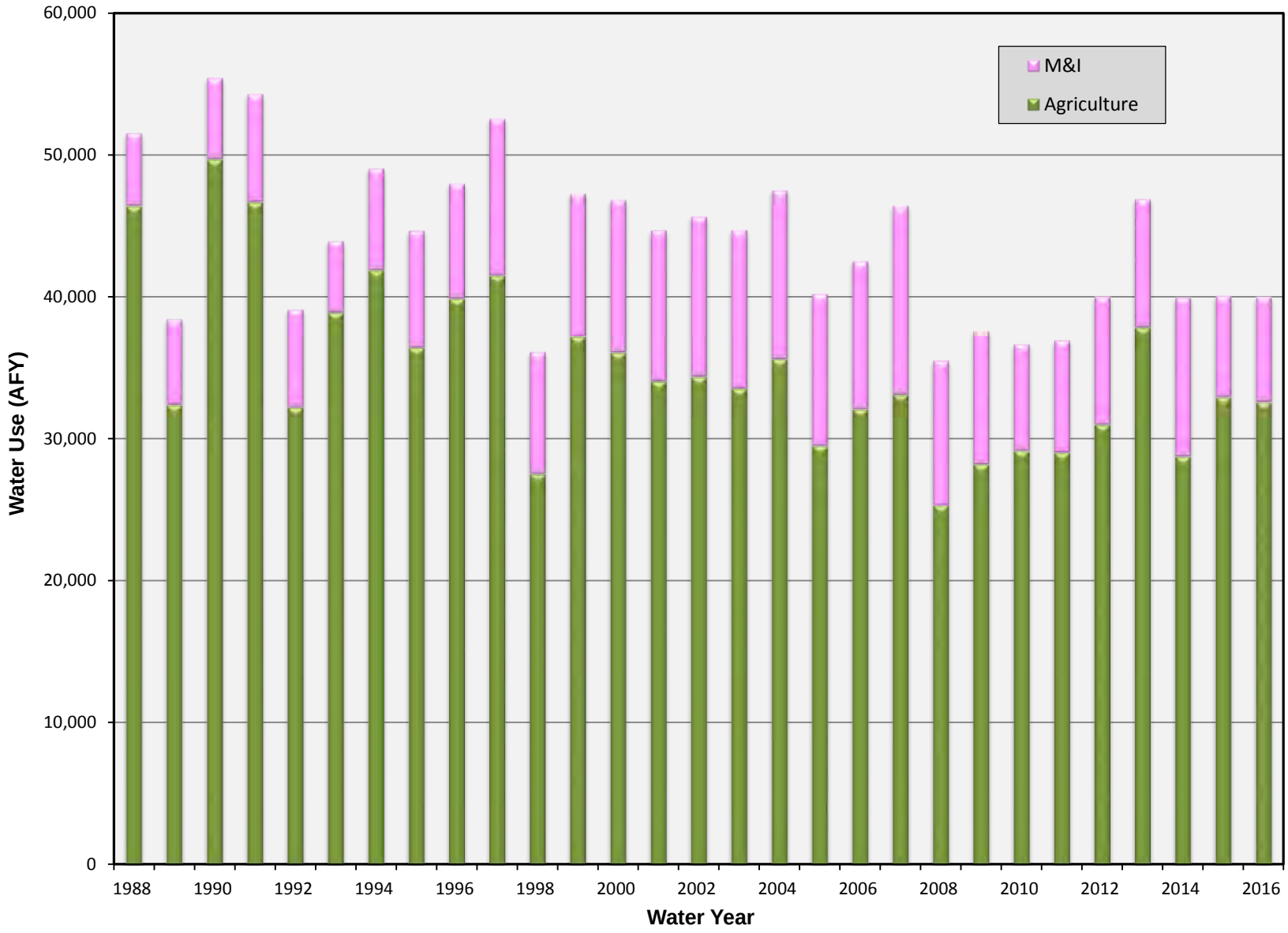
1. Data from Hollister Cienega Wells for 2005-2008 was estimated to be the same as WY 2009
Cells with no data indicate that the information is unavailable, while years with no use are shown explicitly as 0's.



December 2016

TODD GROUNDWATER

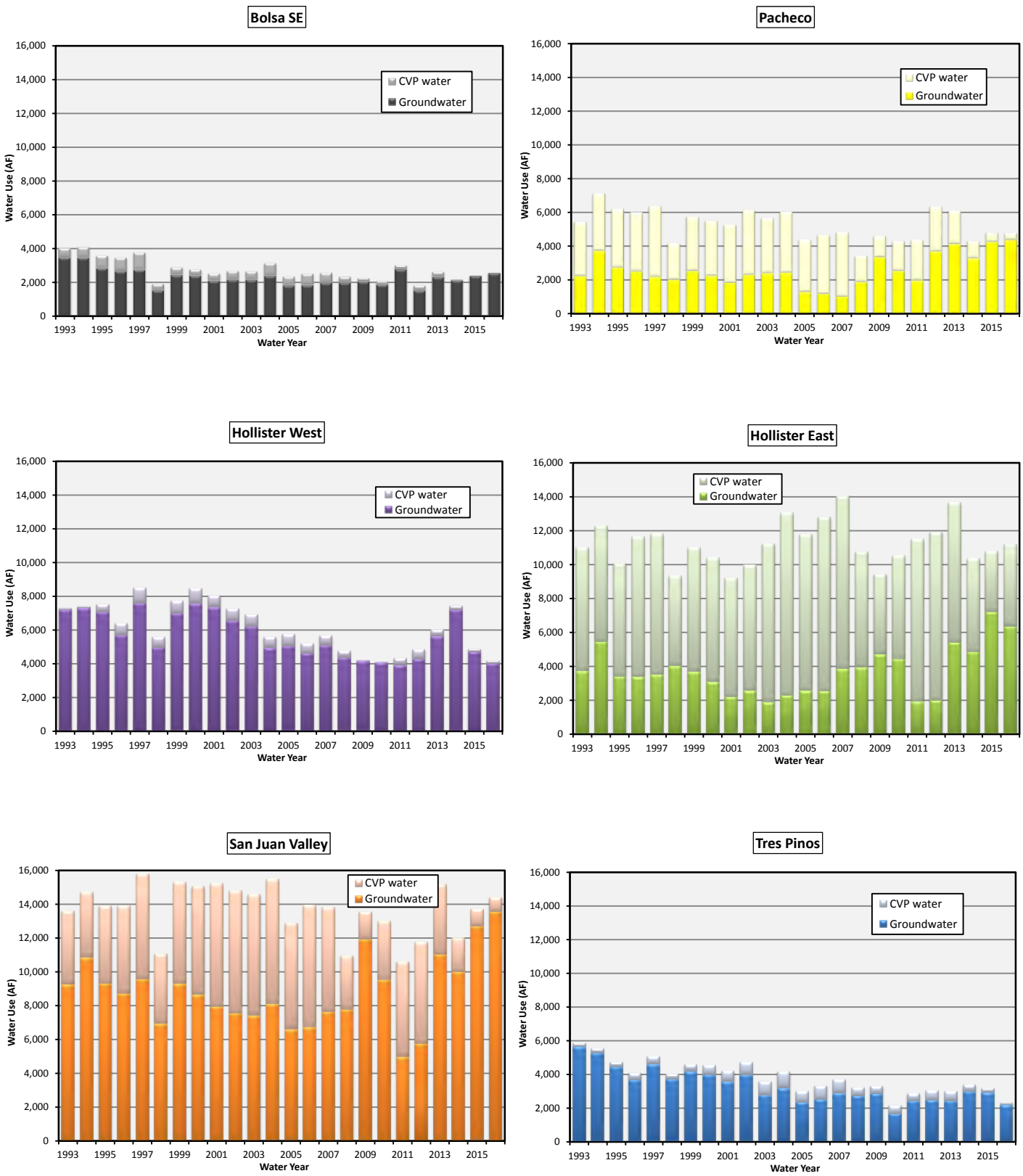
Figure E-1
Groundwater Percentage of Total Water Use



December 2016

TODD GROUNDWATER

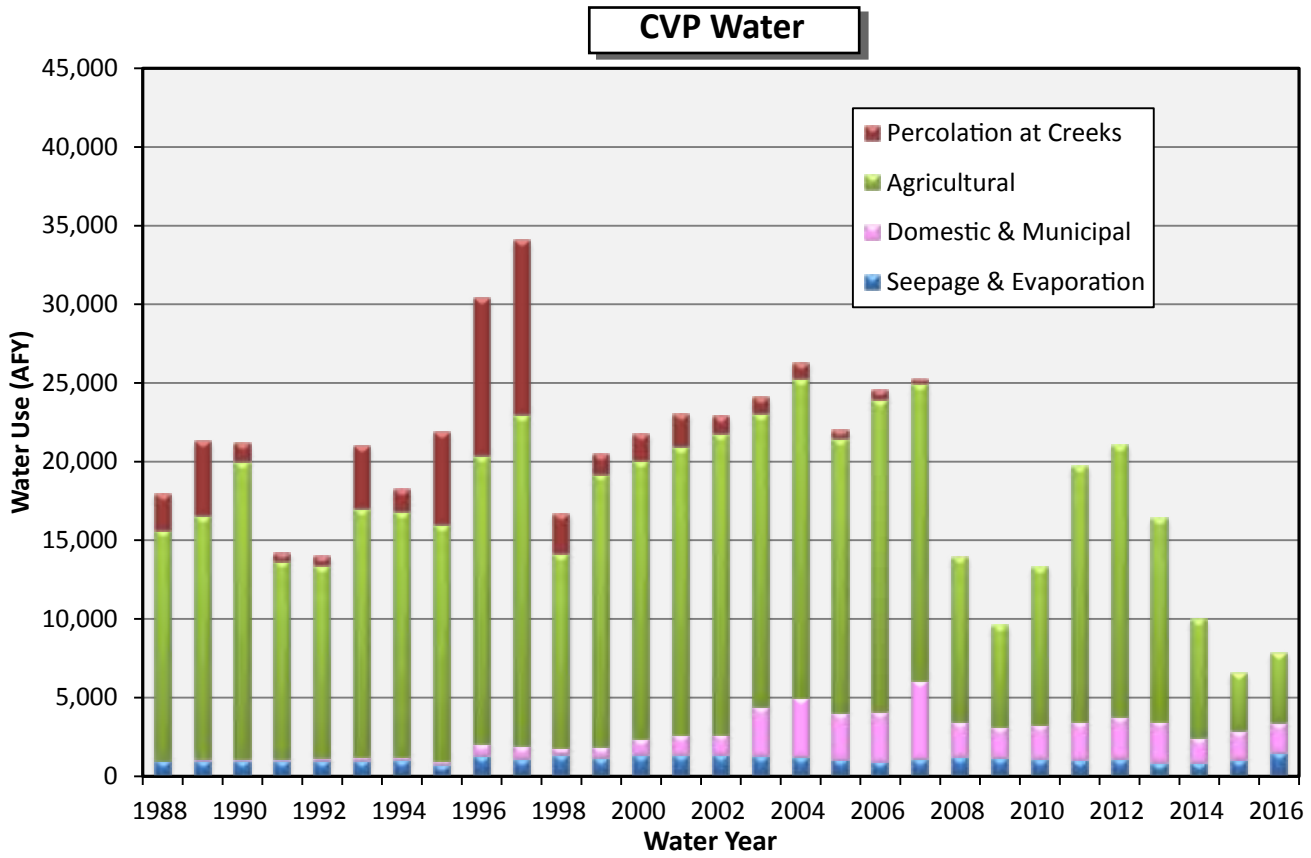
Figure E-2
Water Use in Zone 6 by User Category

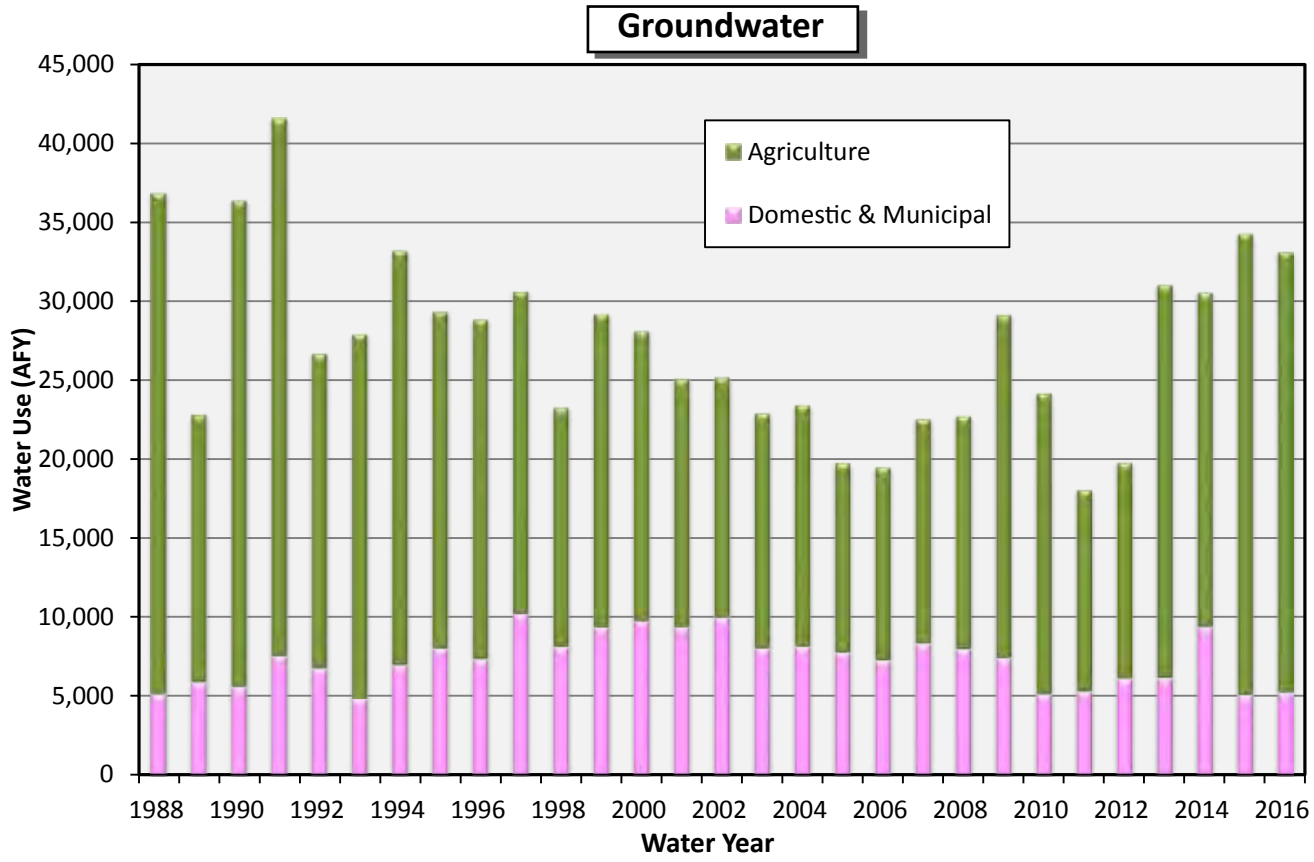


December 2016

TODD GROUNDWATER

Figure E-3
Total Subbasin Water Use by Water Type

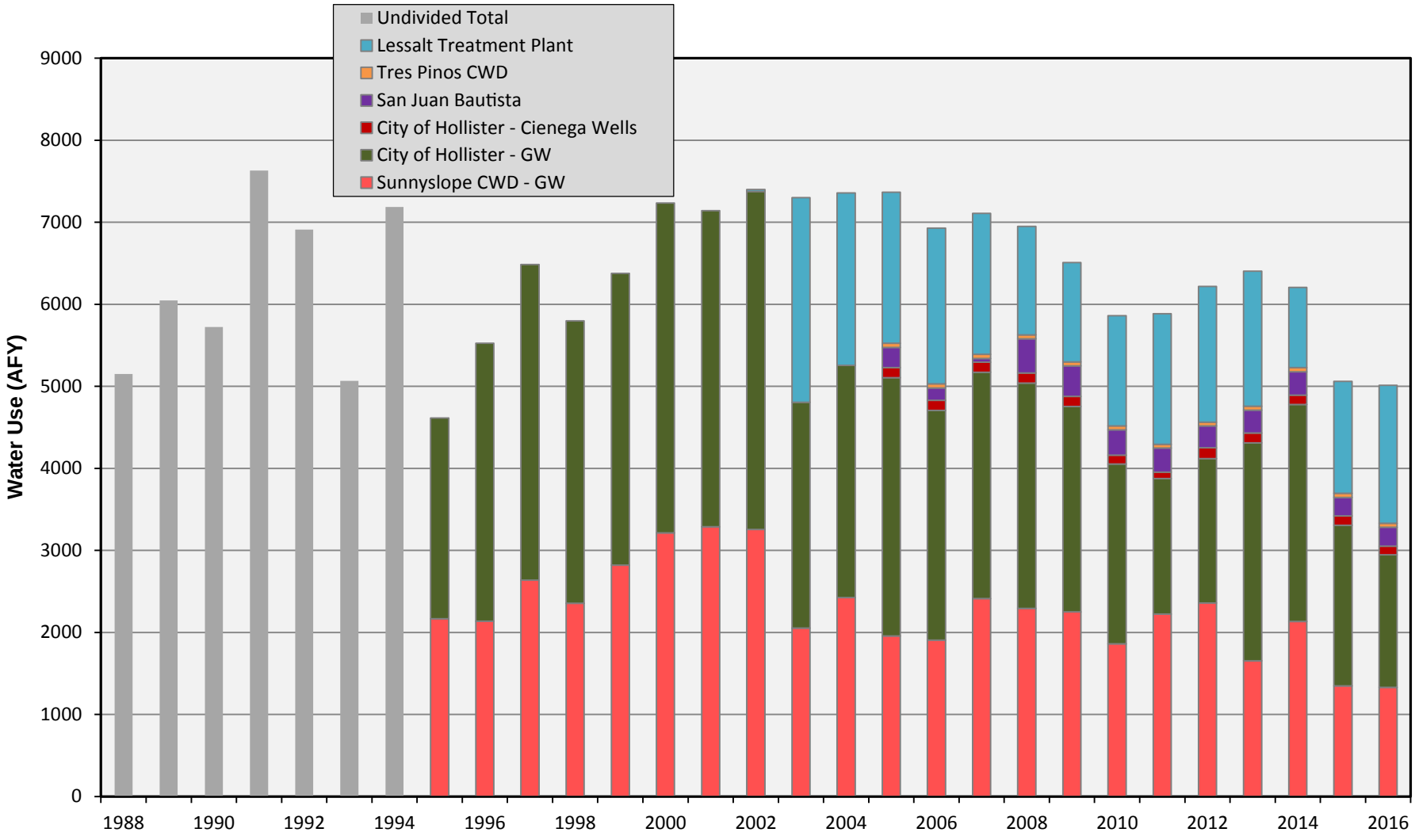




December 2016

TODD GROUNDWATER

Figure E-4
Annual Total of CVP and Groundwater by Use



December 2016

TODD GROUNDWATER

Figure E-5
Municipal Water Use by Purveyor

F RATES AND CHARGES

List of Tables and Figures

Table F-1. Historical and Current District CVP (Blue Valve) Water Rates (dollars/AF)

Table F-2. 2017 Recommended Groundwater Revenue Requirement/Charges (USBR Water Year 2017-2018)

Table F-3. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

Table F-1. Historical and Current San Benito County Water District CVP (Blue Valve) Water Rates (dollars/af)

USBR Water Year	Standby & Availability Charge (dollars/acre)	Water Charge		Power Charge					Groundwater Charge (dollars/af)			Recycled Water (per AF)	
		Agricultural	Municipal & Industrial	Distribution Subsystem					Agricultural	Municipal & Industrial		Agricultural	Power Charge
				2	6H	9L	9H	Others					
1987	$8.00	$34.00	n.c.						n.i.	n.i.			
1988	$2.00	$34.00	n.c.						n.i.	n.i.			
1991	$4.00	$38.00	$110.00						$6.25	$22.00			
1992	$4.00	$45.00	$120.00						$2.00	$10.00			
1994	$4.50	$77.61	$168.92						$1.00	$5.00			
1995	$4.50	$77.61	$168.92						$1.00	$15.75	First 100 af		
										$36.70	Next 500 af		
										$54.60	Over 600 af		
1996	$6.00	$75.00	$150.00						$1.50	$33.00			
1997	$6.00	$75.00	$157.00						$1.50	$33.00			
1998	$6.00	$75.00	$155.00						$1.50	$33.00			
2000	$6.00	$75.00	$155.00						$1.50	$11.50			
2001	$6.00	$75.00	$155.00						$1.50	$25.00			
2004	$6.00	$75.00	$150.00	$24.30	$46.75	$25.05	$53.70	$15.25	$1.50	$10.00			
2005	$6.00	$80.00	$150.00	$26.15	$49.40	$35.00	$66.90	$17.10	$1.50	$21.50			
2006	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50			
2007	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50			
2008	$6.00	$100.00	$170.00	$17.25	$19.40	$32.60	$62.75	$14.85	$1.50	$21.50			
2009	$6.00	$115.00	$180.00	$17.50	$20.25	$42.55	$74.85	$16.30	$2.50	$22.50			
2010	$6.00	$135.00	$200.00	$22.00	$27.30	$49.75	$84.35	$21.75	$2.50	$22.50			
2011	$6.00	$155.00	$220.00	$22.70	$28.15	$51.25	$86.90	$22.40	$2.50	$22.50			
2012	$6.00	$170.00	$235.00	$23.35	$29.00	$52.80	$89.50	$23.10	$2.50	$22.50			
2013	$6.00	$170.00	$235.00	$40.30	$29.25	$43.05	$91.55	$22.40	$3.25	$23.25			
2014	$6.00	$170.00	$238.00	$41.55	$30.15	$44.35	$94.30	$23.10	$3.60	$23.25			
2015	$6.00	$179.00	$247.00	$42.75	$31.05	$45.70	$97.15	$23.80	$3.95	$23.25			
2016	$6.00	$272.00	$363.00	$123.10	$75.65	$109.95	$162.55	$66.05	$4.95	$24.25		$182.55	$57.70

Notes:

af = acre-feet.
n.c. = no classification.
n.i. = not implemented
All rates effective March 1 through following February.

Table F-2. 2017 Recommended Groundwater Revenue Requirement/Charges

REVENUE REQUIREMENTS					Rates [2]	
	Component	Rate ($/AF)	Quantity[1] (af)	Amount	Ag	M & I
Source of Supply						
Ag	Source of Supply Costs	$9.14	22,438	$ 205,070	$ 9.14	
M&I	Source of Supply Costs	$27.42	5,725	$ 156,970		$ 27.42
Percolation Costs						
Ag	CVP Water Rate[3]	$301.23	-	$ -	$ -	
M&I	CVP Water Rate[3]	$411.93	-	$ -		$ -
Ag	Power Charge for Percolation	$0.00	-	0	$ -	
M&I	Power Charge for Percolation	$0.00	-	0		$ -
Calculated Total					$ 9.14	$ 27.42
Previous Groundwater Charge (per acre foot)					$ 4.95	$ 24.25
CURRENT AND RECOMMENDED CHARGES (per acre foot)					**$ 6.45**	**$ 24.25**

1 Assumed Volumes
Percolation (based on average of last 3 years of recharge
Groundwater Usage (based on average of past 4 years)
2 Rates=Revenue Requirement/projected usage
3 CVP water rate basis for 2017-2018 water year

Note: Section 70-7.8 (a) of the District Act states that the agricultural rate shall not exceed one-third of the rates for all water other than agricultural water.

Table F-3. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

	Irrigation[1]						Municipal & Industrial					
User Category and Cost Item	Cost of service (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]	Cost of service[2] (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]
1994	$71.68	$6.20	n.a.		$77.88	$17.21	$165.67	$12.40	n.a.		$178.07	$85.86
1995	$66.47	$6.35	n.a.		$72.82	$17.21	$132.90	$12.69	n.a.		$145.59	$85.86
1996	$65.63	$6.53	n.a.		$72.16	$27.46	$127.40	$13.06	n.a.		$140.46	$85.86
1997	$69.57	$6.70	n.a.		$76.27	$27.46	$143.27	$13.39	n.a.		$156.66	$85.86
1998	$61.58	$6.88	$5.00		$73.46	$27.46	$130.88	$13.76	$5.00		$149.64	$85.86
1999	$60.30	$6.98	$2.73		$70.01	$27.46	$127.91	$13.96	$2.73		$144.60	$85.86
2000	$64.24	$7.10	$6.43		$77.77	$27.46	$129.59	$14.20	$6.43		$150.22	$85.86
2001	$69.50	$7.28	$2.65		$79.43	$27.46	$129.40	$14.56	$4.15		$148.11	$85.86
2002	$68.71	$7.54	$6.61		$82.86	$24.30	$130.32	$15.08	$6.61		$152.01	$79.13
2003	$72.20	$7.69	$5.46		$85.35	$24.30	$129.07	$15.38	$5.46		$149.91	$79.13
2004	$74.52	$7.82	$6.61		$88.95	$24.30	$134.86	$15.64	$6.61		$157.11	$79.13
2005	$77.10	$7.93	$7.99		$93.02	$24.30	$132.01	$15.87	$7.99		$155.87	$79.13
2006	$91.13	$8.24	$9.31		$108.68	$30.93	$214.41	$16.49	$9.31		$240.21	$77.12
2007	$93.53	$8.58	$9.99	$0.11	$112.21	$30.93	$215.32	$17.15	$9.99	$0.11	$242.46	$80.08
2008[6]	$28.12	$8.79	$10.95	$0.07	$47.93	$30.93	$33.34	$17.57	$10.95	$0.07	$61.68	$33.34
2009	$30.20	$9.06	$11.49	$0.07	$50.82	$30.20	$32.77	$18.12	$11.49	$0.07	$62.45	$32.77
2010	$33.27	$9.11	$11.91	$0.11	$54.40	$33.27	$36.11	$18.23	$11.91	$0.11	$66.36	$36.11
2011	$38.92	$9.29	$9.51	$0.05	$57.77	$38.92	$42.58	$18.59	$9.51	$0.05	$70.73	$42.58
2012	$39.71	$9.39	$15.20	$0.05	$64.35	$39.71	$37.95	$18.78	$15.20	$0.05	$71.98	$37.95
2013	$40.39	$9.79	$17.29	$0.05	$67.52	$39.91	$38.71	$19.58	$17.29	$0.05	$75.63	$40.92
2014	$46.87	$9.99	$28.81	$0.23	$85.90	$46.87	$29.70	$19.98	$28.81	$0.23	$78.72	$29.70
2015	$53.82	$10.07	$30.66	$0.23	$94.78	$53.82	$34.74	$20.14	$30.66	$0.23	$85.77	$34.74
2016	$85.12	$10.21	$23.71	$0.30	$119.40	$38.28	$61.24	$20.41	$23.71	$0.30	$105.66	$23.42

Notes:

(1) Total USBR rate given for non-full cost users only, as they represent the majority of water users.

(2) Cost-of-service for agricultural and municipal and industrial users includes a capital repayment rate and an operation and maintenance (O&M) rate. For municipal and industrial customers, cost-of-service also includes a deficit charge, which includes interest on unpaid O&M and interest on capital and on unpaid deficit.

(3) Restoration fund charges apply October 1 through September 30.

(4) Beginning in 1998, the San Luis-Delta Mendota Water Authority instituted this charge to "self-fund" costs associated with maintaining the Delta-Mendota Canal and certain other facilities, which were formerly funded directly by the Bureau of Reclamation. SLDMWA issues preliminary rates in December for the upcoming contract year (March-February). These rates are used for rate-setting purposes; actual rates may vary.

(5) The contract rate is the minimum rate CVP contractors are allowed to pay. To the extent that the contract rate does not cover interest plus actual operation and maintenance costs, a contractor deficit is accumulated that is charged interest at the current-year treasury borrowing rate.

(6) Per the amendatory contract with the USBR "out of basin" capital costs that were previously included in the cost of service are now under a separate repayment contract.

(7) Cost of service rates are inclusive of USBR direct pumping and Project Use Energy costs.

G WATER QUALITY

List of Attachments

Table G-1. Total Dissolved Solids Concentrations from District's Monitoring Program

Table G-2. Nitrate Concentrations from District's Monitoring Program

Table G-3. Water Quality Goals and Standards

Table G-4. Summary of Water Quality Exceedances

Table G-5. List of Regulated Facilities

Figure G-1. District's Water Quality Monitoring Network

Figure G-2. Locations of Regulated Facilities

Figure G-3. General Areas of Similar Total Dissolved Solids concentrations (Updated 2016)

Figure G-4. Maximum Nitrate Concentrations (2013-2016)

Figure G-5. Chromium VI Monitoring and Detections (2013-2016)

Table G-1. SBCWD Monitoring Well Water Quality Data - Nitrate as NO3 mg/L

Date	Brian's Nested Well					MW 11	MW 12	MW 17	MW 18	MW 19	MW 21	MW 24	MW 28	MW 31	MW 36	MW 39	MW 41	MW 42 (Tri Cal)	MW 43	MW 45	MW 46	MW 47	MW 48	MW 49	MW 51	MW 52
	A	B	C	D	E																					
	NITRATE (AS NO3)																									
Apr-97											32	170														
Aug-98							7	6	12		46	220								16						
Sep-01						15	14	3	17	16	83	228	2		8	15	4	31	3	24	3		12			
Oct-01														57								86				
Jan-02						21	13	2				242	2	53	8	12	2	30	2	20	2	124		106		
Mar-02																							32			
Apr-02						19	13	3		80	33	3	3	53	7	10	3	28	3	21	3	114	10	112		
Jul-02						17	14	3		15	37	199	3	54	9	16	3	30	3	24	3	122		111		
Oct-02						20	18	2		15	80		3	55	9	16		35	3	28	3	129	13	112		
Jan-03						17	17	4		4	66	336	4	56	11	13	4	35	4	22	4	122	13	104		
Apr-03						21	20	3		11	83	327	4	69	9	12	3	36	3	27	3	114	13	116		
Jul-03						20	17	3		3	37	108	3	57	7	15	3	33	3	22	3	123	3	98		
Aug-03																19										
Oct-03						19	18	3		5	75	228	3	53	8	14	3	33	4	25	3	120	8	94		
Jan-04						15	15	2	24		33	513	2	44	13	14	5	31	3	22			17	81		
Nov-04						16	19	2	8		61	259	2	44	5	7	2	35	2	20	2	101		82		
May-05						21	24	2	10		45	161	2	44	6	9	2	34	3	24	3	110		88		
Nov-05						19	23	3	14	9	57	321	4	47	7	10	3	33	3	23	4	103	11	78		
Apr-06						24		4	24		82	393	4	63	12	12	4	43	3	35	4	120		94		
Oct-06						22	18	5	22	76	47	501	3	53	8	14	4	35	4	25	5	140	14			
Feb-07	7	1	1	1	5																					
Apr-07						20		2	14			321	2	49	6	10	2	32	3	26	2	98				
Nov-07						23		5	14		42	295	4	31	9	12	4	33	3	29	3	128		74		
Apr-08						26							5	31				31	4		5					
May-08											36	225			17	15				25		99				
Nov-08						26		8				332	3	216	20	17	40	42	5	36		73		6		
Oct-09						30	2	7		19	23	3		175	8	27	44	32	2	7	12	53			7	2
Nov-09	2	2	2	2	2																					
Apr-10						19	19	8		35	4	3	3	208	3			41		29		3		65	9	3
Oct-10		4	4	5	4	30		13		10	5	301	5	225		11		39	5	27	4	36			10	4
Apr-11						29	17	10		3	4	230	4	179	10	15		36	4	3	24	67		44	8	3
Jun-11	4	3	17	4	7																					
Nov-11								11		5			4	170				33	4	26	4			4	5	5
Dec-12						18	17	11			5	23	4	74	9			24	5	17	5	7			10	5
Jun-13	6	25	5	5	6	28		19			6	180	31	211	9	14		36	5					31	14	6
Dec-13						30		17				283	3	222		4			3	27	3	42		30	12	3
Jan-14	3	15	2	3	3																					
May-14	3	18	2	3	3	30	16	18			2	302	2	212		3		35	3	24				13	3	
Nov-14	7	18	7	6	6			13				247	6	205				29	7	21	25				12	7
May-15	5	19	8	5	5	26	18	13			5		5	215		5		23		25						6
May-16	3	4	6	3	3	29	89	11		4	4	38	102	198		19		17			4				12	4

Note: Shading indicates values that exceed the primary maximum contaminent limit (MCL) for drinking water, 45 mg/L

Table G-2. SBCWD Monitoring Well Water Quality Data - Total Dissolved Solids mg/L

Date	Brian's Nested Well					MW 11	MW 12	MW 17	MW 18	MW 19	MW 21	MW 24	MW 28	MW 31	MW 36	MW 39	MW 41	MW 42 (Tri Cal)	MW 43	MW 45	MW 46	MW 47	MW 48	MW 49	MW 51	MW 52
	A	B	C	D	E																					
	TOTAL DISSOLVED SOLIDS																									
Apr-97											1,500	2,300														
Aug-98						1,010	1,160	600	800		1,720	2,780								840						
Sep-01						1,175	1,220	543	810	1,168	2,100	2,482	875		1,173	852	2,135	347	493	845	593		1,098			
Oct-01														1,360								2,032				
Jan-02						1,156	1,292	538				2,786	948	1,376	1,178	816	2,032	360	564	836	582	1,774		1,084		
Mar-02																							1,078			
Apr-02						1,180	1,266	538		1,398	1,630	538	926	1,352	1,152	782	1,964	368	726	824	582	1,760	1,090	932		
Jul-02						1,216	1,216	542		1,114	1,676	2,506	926	1,386	1,170	868	2,014	354	724	806	594	1,996		1,078		
Oct-02						1,178	1,186	570		1,120	2,052		926	1,326	1,178	1,014		394	532	834	628	1,862	1,084	1,020		
Jan-03						1,056	1,086	516		966	2,024	2,448	870	1,198	1,094	838	1,970	346	470	768	550	1,548	1,046	746		
Apr-03						1,182	1,294	514		1,140	2,072	2,736	914	1,444	1,132	900	2,092	362	528	818	598	1,892	1,076	976		
Jul-03						1,244	1,312	542		1,084	1,640	2,692	950	1,376	1,180	888	2,144	372	546	802	610	2,004	856	1,004		
Aug-03																1,000										
Oct-03						1,188	1,164	556		1,110	2,110	3,064	892	1,424	1,200	942	2,144	394	526	836	628	1,888	966	948		
Jan-04						1,218	1,316	528	774		1,766	2,910	870	1,282	1,156	844	2,074	380	502	798			1,058	902		
Nov-04						1,302	1,372	544	740		1,936	3,470	946	1,336	1,202	888	2,128	368	540	854	568	2,194		1,012		
May-05						1,168	1,308	518	706		1,574	2,250	886	1,178	1,112	866	2,092	374	542	874	580	1,964		768		
Nov-05						1,246	1,398	532	774	1,114	1,874	3,544	888	1,390	1,232	982	2,110	386	562	854	590	2,208	1,034	876		
Apr-06						1,184		528	818		2,006	3,120	902	1,280	1,178	922	2,076	372	548	902	592	1,958		904		
Oct-06						1,292	1,294	666	786	1,460	1,090	2,826	1,012	1,374	1,074	940	1,924	440	630	758	628	1,772	676			
Feb-07	1,372	1,410	1,128	1,302	2,440																					
Apr-07						1,088		526	762			2,486	664	1,242	1,096	980	2,030	264	528	780	566	1,848				
Nov-07						882		476	616		1,256	2,024	656	900	886	782	1,434	316	466	696	512	1,414		654		
Apr-08						1,076							810	970				370	546		562					
May-08											1,462	2,528			1,102	872				814		1,782				
Nov-08						1,064		560				3,036	856	2,152	868	1,116	2,400	372	568	860		1,536		400		
Apr-09						1,112	916	528			312	2,780	848	2,068	2,428	1,100	860	346		780	568	1,772		728	644	
Oct-09						1,024	548	576		1,092	360	2,864		2,088	848	1,444	1,040	352	528	656	1,008	1,436			656	768
Nov-09	1,160	1,148	1,108	1,140	1,136																					
Apr-10						955	955	555		422	343	1,783	850	2,032	330			363		815		1,812		688	695	794
Oct-10		753	1,000	887	1,105	1,168		528		967	352	2,683	335	1,928		1,057		368	528	815	572	1,215			703	843
Apr-11						1,192	1,168	524		944	348	2,752	868	1,784	732	1,120		376	532	560	848	1,600		660	704	764
Jun-11	644	724	2,764	1,028	772																					
Nov-11								532		932			848	1,648				368	468	796	548			232	320	704
Dec-12						1,096	1,580	516			288	1,348	824	1,648	720			376	508	892	512	1,760			788	1,032
Jun-13	624	2,784	936	600	796	1,124		500			348	2,444	1,028	1,820	480	964		368	520					1,028	712	840
Dec-13						1,012		524				2,520	320	1,704		916			536	800	544	1,344		552	708	744
Jan-14	992	2,868	1,112	792	928																					
May-14	1,004	2,880	1,564	568	808	1,208	1,232	536			352	2,756	712	1,720		912		388	556	856				540	840	
Nov-14	888	2,880	1,816	820	900			548				2,904	704	2,000				1,484	532	876	1,212				724	740
May-15	856	2,860	1,696	812	916	1,160	1,204	560			356		708	1,960		992		798		868						900
May-16	520	2,788	1,592	652	832	1,152	2,276	540		960	332	1,184	1,252	1,696		1,192		420			564				720	1,304

Note: Shading indicates values that exceed water quality goals (yellow > 500 mg/L and drak green > 1,000 mg/L)

Table G-3. Water Quality Goals and Standards

Constituents of Concern	Units	Drinking Water Standards Maximum Contaminant Levels (MCLs)				Other Standards				
		State Water Resources Control Board		USEPA		California DHS			RWQCB Basin Plan Water Quality Objectives for Irrigation	
		Primary	Secondary	Primary	Secondary	Public Health Goal (PHG)	Action Level (AL)	Agricultural Water Quality Limits	Irrigation Supply	Livestock Watering
MAJOR CATIONS:										
calcium	mg/L	–	–	–	–	–	–	–	–	–
magnesium	mg/L	–	–	–	–	–	–	–	–	–
sodium	mg/L	–	–	–	–	–	–	69	–	–
potassium	mg/L	–	–	–	–	–	–	–	–	–
MAJOR ANIONS:										
chloride	mg/L	–	250	–	250	–	–	106	–	–
sulfate	mg/L	–	250	500	250	–	–	–	–	–
bicarbonate	mg/L	–	–	–	–	–	–	–	–	–
carbonate	mg/L	–	–	–	–	–	–	–	–	–
MINOR IONS:										
hydroxide (as CaCO3)	mg/L	–	–	–	–	–	–	–	–	–
iron	mg/L	–	0.3	–	0.3	–	–	0.5	5	–
manganese	mg/L	–	0.05	–	0.05	–	0.5	0.2	0.2	–
fluoride*	mg/L	2	–	4	2	1	–	1	1	2
nitrate as NO3 –	mg/L	45	–	–	–	–	–	–	–	–
nitrate as nitrogen	mg/L	–	–	10	–	10	–	–	–	–
nitrite (NO2 –) as nitrogen	mg/L	1	–	1	–	1	–	–	–	10
nitrate + nitrite as nitrogen	mg/L	10	–	10	–	10	–	–	–	100
PHYSICAL PROPERTIES:										
apparent color	Color Units	–	15	–	15	–	–	–	–	–
conductivity	micromohs/cm	–	900	–	–	–	–	700	–	–
odor	TON@60°C	–	3	–	3	–	–	–	–	–
total alkalinity (as CaCO3)	mg/L	–	–	–	–	–	–	–	–	–
total dissolved solids (TDS)	mg/L	–	500	–	500	–	–	450	–	–
total hardness (as CaCO3)	mg/L	–	–	–	–	–	–	–	–	–
turbidity	NTU	1/5**	5	1/5**	–	–	–	–	–	–
pH	SU	–	–	–	6.5 to 8.5	–	–	6.5 to 8.4	5.5 to 8.3	–
TRACE IONS:										
aluminum	mg/L	1	0.2	–	0.050 to 0.2	0.6	–	5	5	5
antimony	mg/L	0.006	–	0.006	–	0.02	–	–	–	–
arsenic	mg/L	0.05	–	0.01	–	0.000004	–	0.1	0.1	0.2
barium	mg/L	1	–	2	–	2	–	–	–	–
beryllium	mg/L	0.004	–	0.004	–	0.001	–	0.1	0.1	–
boron	mg/L	–	–	–	–	–	1	0.700/0.750†	0.5	5
cadmium	mg/L	0.005	–	0.005	–	0.00004	0.00007	–	0.01	0.05
chromium vi	ug/L	10		0.1		0.02			0.1	1
cobalt	mg/L								0.05	1
copper	mg/L	1.3		1.3	1	0.3		0.2		
lead	mg/L	1.015		0.015		0.0002		5	5	0.1
lithium	mg/L								2.5	
mercury	mg/L	0.002		0.002		0.0012				
molybdenum	mg/L								0.01	0.5
nickel	mg/L	0.1				0.012		0.2	0	
selenium	mg/L	0.05		0.5				0.002		
silver	mg/L				0.1				0.02	0.05
thallium	mg/L	0.002		0.002		0.0001				
vanadium	mg/L	–	–	–	–	–	0.05	0.1	0.1	0.1
zinc	mg/L	–	5	–	5	–	–	2	2	25
VOCs:										
1,1,1-trichloroethane	mg/L	1000	–	0.2	–	200	–	–	–	–
,1,2-trichloro-1,2,2-trifluoroethan	mg/L	4000	–	1.2	–	1200	–	–	–	–
1,1,2-trichloroethane	mg/L	5	–	0.005	–	0.3	–	–	–	–
1,1-dichloroethane	mg/L	5	–	0.005	–	3	–	–	–	–
1,1-dichloroethene	mg/L	6	–	0.006	–	10	–	–	–	–
1,2,3-trichlorobenzene	mg/L	–	–	0	–	–	–	–	–	–
1,2,4-trichlorobenzene	mg/L	–	–	0.005	–	–	–	–	–	–
1,2-dichlorobenzene	mg/L	0.5	–	0.6	–	0.4	–	–	–	–
1,2-dichloroethane	mg/L	–	–	0.0005	–	–	–	–	–	–
1,2-dichloropropane	mg/L	–	–	0.005	–	–	–	–	–	–
1,3-dichlorobenzene	mg/L	–	–	0.6	–	–	0.6	–	–	–
chlorobenzene	mg/L	–	–	0.07	–	–	–	–	–	–
di(2-ethylhexyl)phthalate	mg/L	–	–	0.004	–	–	–	–	–	–
dichlorodifluoromethane	mg/L	–	–	1	–	–	–	–	–	–
PCE	mg/L	–	–	0.005	–	–	–	–	–	–
TCE	mg/L	0.005	–	0.005	–	0.0017	–	–	–	–
trans-1,2-dichloroethene	mg/L	–	–	0.01	–	–	–	–	–	–
trichlorofluoromethane	mg/L	–	–	0.15	–	–	–	–	–	–
vinyl chloride	mg/L	0.5	–	0.0005	–	0.05	–	–	–	–
BTEX:										

Table G-3. Water Quality Goals and Standards

Constituents of Concern	Units	Drinking Water Standards Maximum Contaminant Levels (MCLs)				Other Standards				
		State Water Resources Control Board		USEPA		California DHS			RWQCB Basin Plan Water Quality Objectives for Irrigation	
		Primary	Secondary	Primary	Secondary	Public Health Goal (PHG)	Action Level (AL)	Agricultural Water Quality Limits	Irrigation Supply	Livestock Watering
MTBE	mg/L	–	–	0.013	–	–	–	–	–	–
Benzene	mg/L	–	–	0.001	–	–	–	–	–	–
Toluene	mg/L	150	–	0.15	–	150	–	–	–	–
Ethylbenzene	mg/L	300	–	0.7	–	300	–	–	–	–
Total xylenes	mg/L	1750	–	1.75	–	1800	–	–	–	–
OTHER:										
MBAS (Surfactants)	mg/L	–	500	–	500	–	–	–	–	–
perchlorate	mg/L	6	–	–	–	1	0.006	0.006	–	–

Notes:
All concentrations in milligrams per liter (mg/L) or parts per million (ppm) except where noted.
Dash (–) indicates no current standard or no available information.
USEPA = U.S. Environmental Protection Agency.
California DHS = California Department of Health Services, now Department of Public Health
MBAS = Methylene Blue Active Substances.
NTU = Nephalometric Turbidity Units.
TON = Threshold Odor Number.
SU = Standard Units
* Optimal fluoride level and (range) vary with average of maximum daily temperature:
50.0 to 53.7 degrees F – 1.2 (1.1 to 1.7) mg/L; 53.8 to 58.3 degrees F – 1.1 (1.0 to 1.7) mg/L
58.4 to 63.8 degrees F – 1.0 (0.9 to 1.5) mg/L; 63.9 to 70.6 degrees F – 0.9 (0.8 to 1.4) mg/L
70.7 to 79.2 degrees F – 0.8 (0.7 to 1.3) mg/L; 79.3 to 90.5 deg

** Systems that use conventional or direct filtration may not exceed 1 NTU at any time or 0.3 NTU for 95th percentile value; systems that use other “alternative” filtration systems may not exceed 5 NTU at any time or 1 NTU for 95th percentile value.

† USEPA recommended agricultural limit for boron is 0.750 mg/L.
References:
Current USEPA and California DHS drinking water standards from California

Table G-4. Summary of Samples Exceeding Water Quality Standards from 2013-2016

				Number of Samples Exceeding Water Quality Standard								
Constituent	**Report Units**	**Minimum Water Quality Standard**	**Source of Standard**	**Bolsa**	**Bolsa SE**	**Hollister East**	**Hollister West**	**Pacheco**	**San Juan**	**Tres Pinos**	**Paicines**	**Out of Basin**
MAJOR CATIONS:												
Sodium	MG/L	69	Agricultural WQ Limits	6		50	100	10	73	25	2	25
MAJOR ANIONS:												
Chloride	MG/L	106	Agricultural WQ Limits	1	1	46	79	7	63	20		14
MINOR IONS:												
Iron	UG/L	300	RWQCB Basin Plan Irrigation Supply & Agricultural WQ Limits & DDW Secondary & USEPA Secondary	1		41	14	4	21	1		59
Manganese	UG/L	50	USEPA Secondary & DDW Secondary	2		60	24	54	152	7		207
Nitrate (As No3)	MG/L	45	DDW Primary		42	4	22	1	33			
Nitrate + Nitrite (As N)	MG/L	10	DDW Primary & USEPA Primary		2	3	8	3	16	5	2	17
NITRATE As N	MG/L	10	USEPA Primary & DDW PHG			2	3	1	5			
Nitrite (As N)	MG/L	1	DDW PHG & USEPA Primary				3	1				7
PHYSICAL PROPERTIES:												
Color	UNITS	15	DDW Secondary & USEPA Secondary			13			4			9
Odor Threshold @ 60 C	TON	3	DDW Secondary & USEPA Secondary			19		2				5
Specific Conductance	US	700	Agricultural WQ Limits	6		55	82	28	125	28	2	47
Total Dissolved Solids	MG/L	450	Agricultural WQ Limits	5		51	97	16	109	25		38
Turbidity, Laboratory	NTU	5	DDW Primary & USEPA Primary & DDW Secondary & DDW Primary	1		35	4	5	18	1		25
TRACE IONS:												
Antimony	UG/L	6	DDW Primary & USEPA Primary									
Aluminum	UG/L	200	USEPA Secondary & DDW Secondary			1	3	2				3
Arsenic	UG/L	0.004	DDW PHG	4		251	7	33	19	2		112
Barium	UG/L	700	DDW PHG			7						
Boron	UG/L	750	RWQCB Basin Plan Irrigation Supply & Agricultural WQ Limits	2		36	33	3	8	18		
Cadmium	UG/L	0	DDW AL	2		10	1	3	3	1		
Chromium VI	UG/L	10	DDW PHG			13	37			24		
Copper	UG/L	170	DDW PHG						1			
Lead	UG/L	2	DDW PHG									
Mercury	UG/L	1	DDW PHG	2		8	1	2	3	1		
Molydbendum	UG/L	10	RWQCB Basin Plan Irrigation Supply									
Nickel	UG/L	0	RWQCB Basin Plan Irrigation Supply				1		1			
Selenium	UG/L	2	Agricultural WQ Limits				1					1
Silver	UG/L	20	RWQCB Basin Plan Irrigation Supply									
Sulfate	MG/L	250	DDW Secondary & USEPA Secondary	1	1	11	42		48	3		3
Thallium	UG/L	0	DDW PHG									
Zinc	UG/L	2000	Agricultural WQ Limits & RWQCB Basin Plan Irrigation Supply									
OTHER:												
Total Trihalomethanes	UG/L	0				24	9	9	6	2	2	51
Perchlorate	UG/L	1							27			

l for each constituent is the one with the lowest allowable concentration.
lic health goal; AL = action level; WQ = water quality

Table G-5a. List of Regulated Facilities with Recent Water Quality Data

Name	Current or Former Operations	# of Wells	Potential Water Quality Problems	Order Number	Notes
Aromas-San Juan USD (Anzar High School)	High school with a wastewater treatment facility	3	salinity, nitrogen species	96-36	
BAE Systems (United Defense)	Ballistics Testing	64	perchlorate, nitrogen species	R3-2055-0113	
CEMEX Ready Mix Plant San Juan Bautista		2			
Chervon 9-1898	Gas station with a leaking underground storage tank	10			
Chevron 9-9156	Gas station with a leaking underground storage tank	1	BTEX	00-68	
Cielo Vista Estates	Housing development with a wastewater treatment facility	3	TDS, Na, Cl, Nitrogen		
Crop Production Services (Western Farm Service)	Fertilizer and Pesticide storage	6	pesticides, nitrogen species, salinity	01-052	
El Toro	Leaking underground storage tank	14	BTEX		
Hollister Domestic WWTP	Domestic wastewater treatment facility for the	13	salinity, nitrogen species	87-47	
Hollister Industrial WWTP	Industrial wastewater treatment facility for the City of Hollister	7	salinity, nitrogen species	00-020	
John Smith Landfill	Waste disposal	19	organic, inorganic, metals	R3-2002-001	
McCormick Teledyne	Explosive products for the aerospace and automotive safety industries	38	perchlorate, nitrogen species, metals, salinity		
MK Ballistics (United Defense)	Ballistics Testing	9	perchlorate	CU-06-00123	
NH3 Service Company	Fertilizer and Pesticide storage	1	pesticides, nitrogen species, salinity		
PSEMC (former PacSci)		11			
Sambrailo Packaging		6	BTEX		
San Juan Bautista WWTP	Wastewater disposal	3	salinity, nitrogen species	R3-2003-0087	
Sunnyslope WWTP	Wastewater disposal	3	salinity, nitrogen species		
Tres Pinos WWTP	Wastewater disposal	4	salinity, nitrogen species	99-101	
Whittaker Ordinance	Manufacturing	199	perchlorate	99-006	

Table G-5b. List of Regulated Facilities with Historical Water Quality Data

Name	Current or Former Operations	# of Wells	Potential Water Quality Problems	Order Number	Notes
Betabel Valley RV Resort	Recreational vehicle camp with a wastewater treatment facility	2	salinity, nitrogen species	88-23	No recent information
Biosystems Management	Biosolids waste disposal	4	salinity, nitrogen species, metals		closed
Blossom Hill Winery	Winery	6	hardenss, salinity		
Casa De Fruta	Fruit stand/tourist attraction with a wastewater treatment facility	5	salinity, nitrogen species		
Chevron 9-1898	Gas station with a leaking underground storage tank	9	BTEX, MTBE		closed
E Ranch Milk	Gas station with a leaking underground storage tank	23	BTEX and other organics, pH, EC	98-68	
El Modeno Gardens	Commercial nursery irrigation runoff	4	salinity, nitrogen species	99-050	
GAF Leatherback Industries Warehouse Facility	Former Saturator	4	VOCs, Petroleum products		Ceased Operations in 2007, RWQCB Site Opened April 2009
Gibson Farms Inc.	Fruit producer (processing wastes)	1	salinity, nitrogen species	R3-2004-0066	
Granite Rock Co	Sand and gravel quarry	6	turbidity	R3-2005-0063	
Laverone Property (BK Towing)	Leaking underground storage tank	14	BTEX	92-101	
Natural Food Selection/ Earthbound Farms	Fruit and Vegetable processing wastes	11	salinity, nitrogen species	R3-2004-006	
Nyland Ranch Warehouse	Leaking underground storage tank	4	salinity, boron		closed
PG &E / City of Hollister Fire Department	Leaking underground storage tank	4	BTEX		Closed 7/21/92
Rancho Justo Company	Golf course with domestic wastewater disposal	3	salinity, nitrogen species		
San Juan Bautista City Yard	Underground storage tanks	6	BTEX		No recent information
San Juan Oaks Golf Club	Golf course with domestic wastewater disposal system	2	salinity, nitrogen species		
TOSCO Facility #3738		3	BTEX		Soil samples only
Victory Gas and Food	Gas station	13	BTEX		No recent information
Wilbur-Ellis	Agricultural products and chemicals marketer and distributor	3	salinity, nitrogen species		

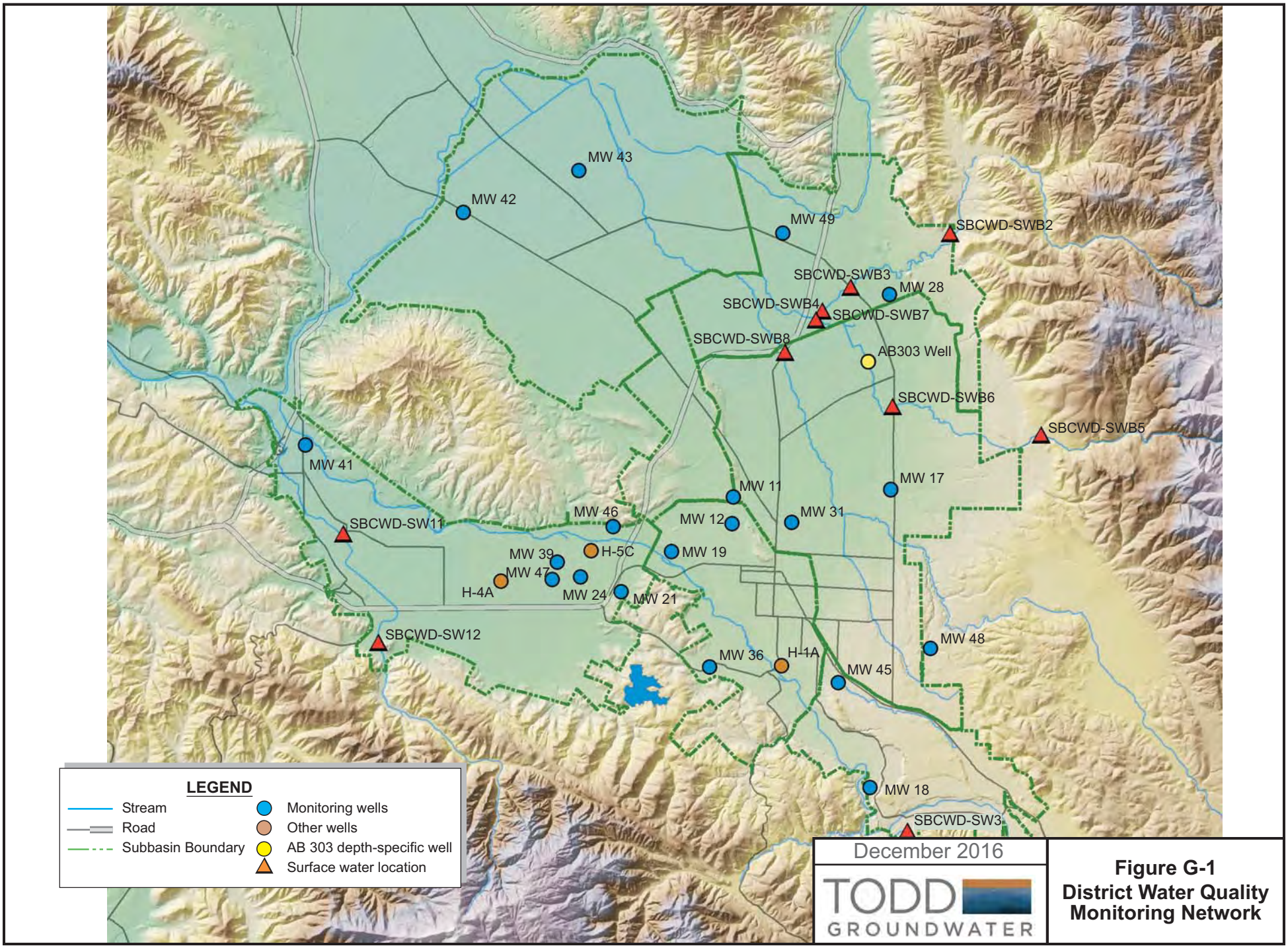


Figure G-1
District Water Quality Monitoring Network

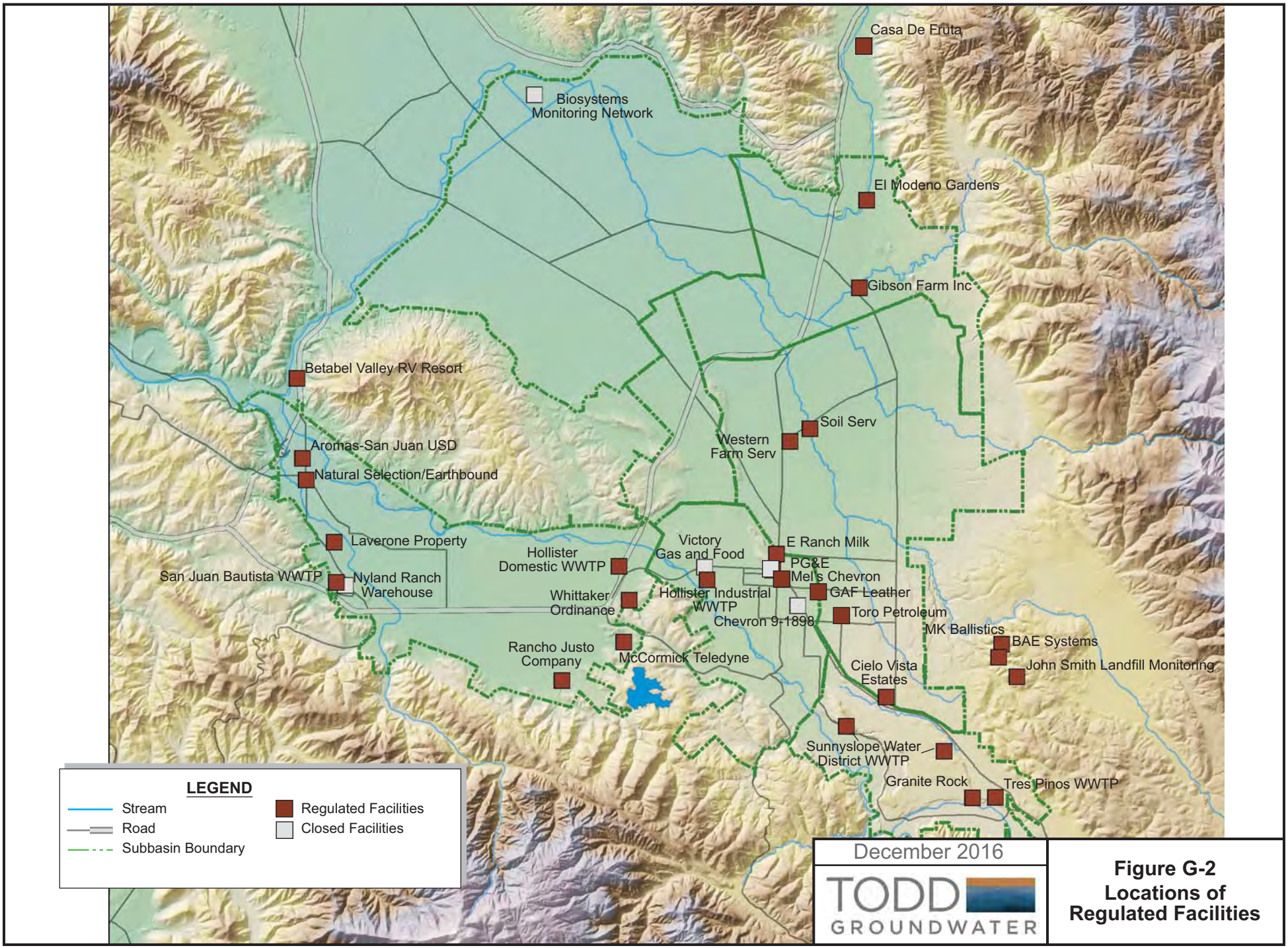
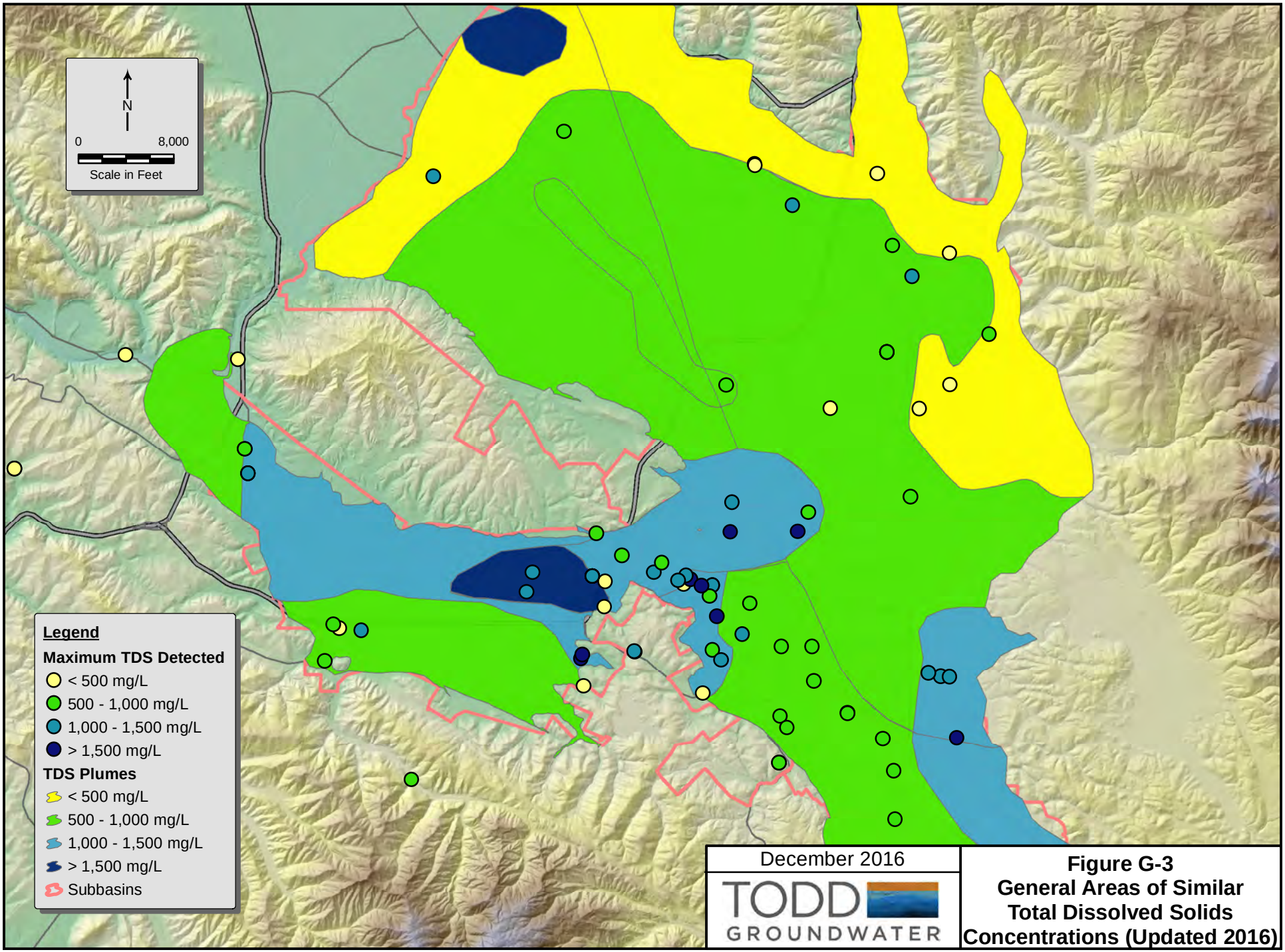


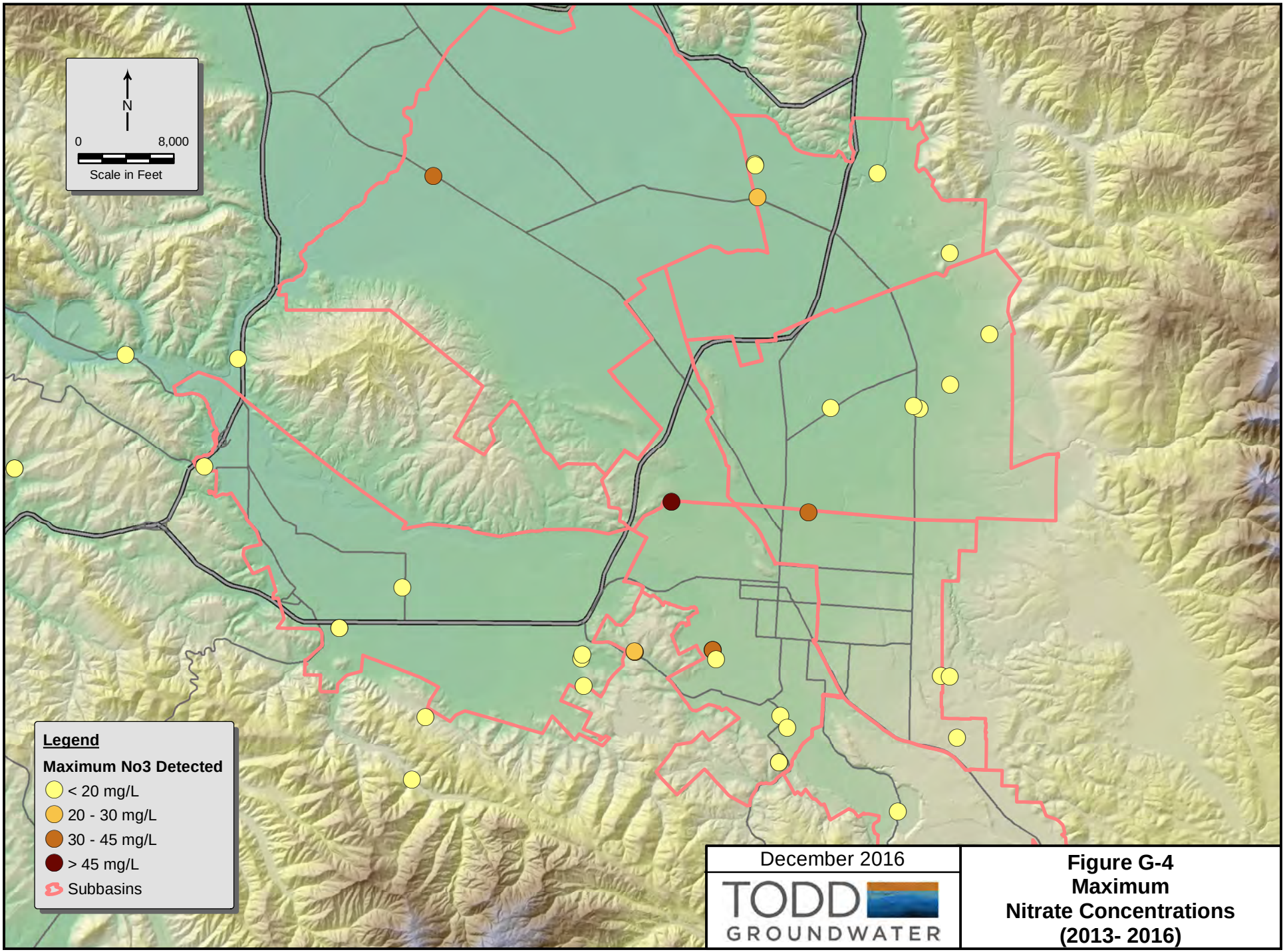
Figure G-2
Locations of Regulated Facilities



December 2016

TODD GROUNDWATER

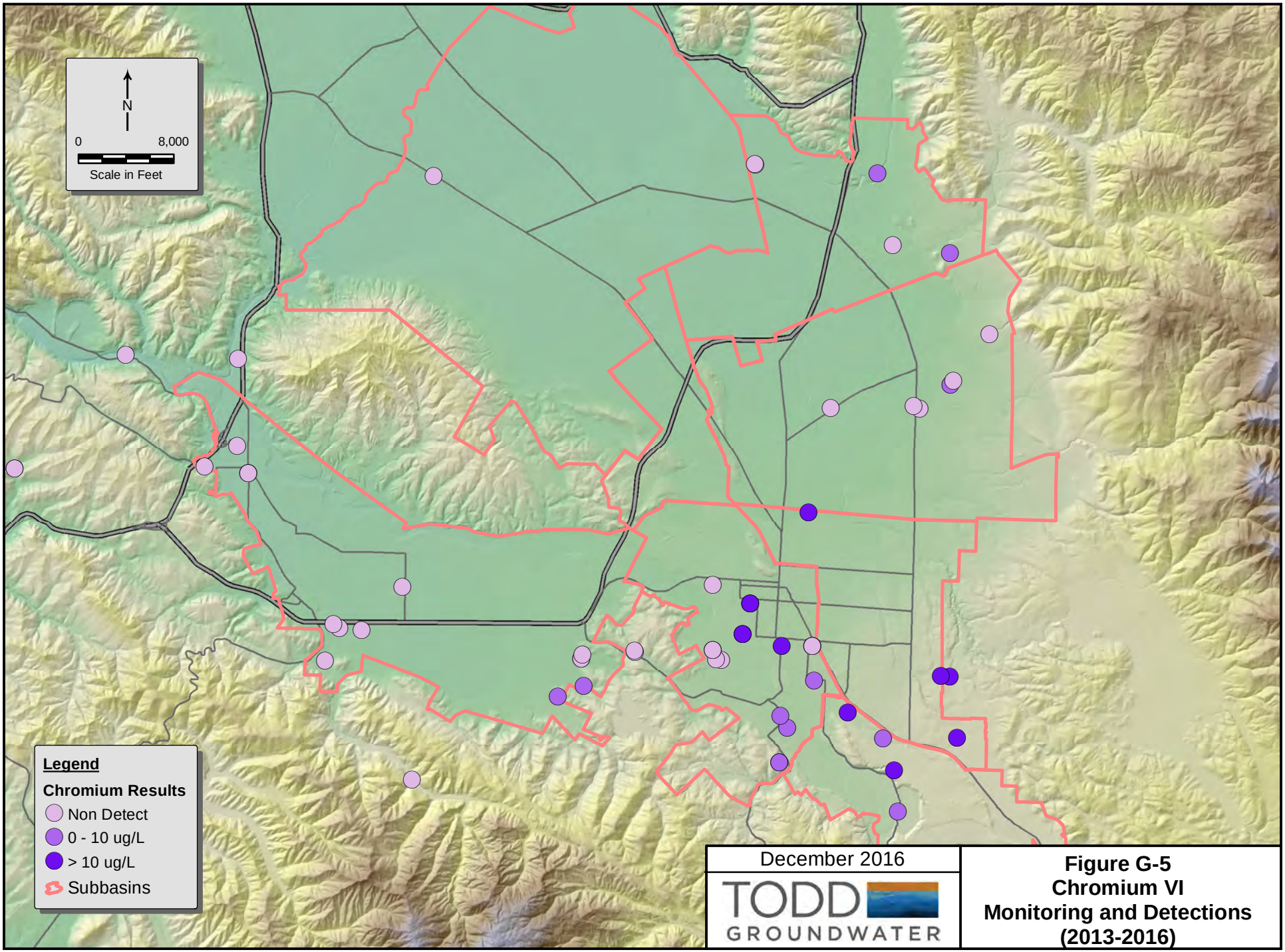
Figure G-3
General Areas of Similar Total Dissolved Solids Concentrations (Updated 2016)



December 2016

TODD GROUNDWATER

Figure G-4
Maximum
Nitrate Concentrations
(2013- 2016)



December 2016

TODD GROUNDWATER

Figure G-5
Chromium VI
Monitoring and Detections
(2013-2016)

H LIST OF ACRONYMS

AF	acre-foot
AFY	acre-foot per year
ag	agriculture
CASGEM	California Statewide Groundwater Elevation Monitoring
CDHSPH	California Department of Public Health
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
COC	Constituent Of Concern
CVP	Central Valley Project
District or SBCWD	San Benito County Water District
DWR	California Department of Water Resources
DWTP	Domestic Wastewater Treatment Plant
ET	evapotranspiration
ft	feet
gpd	gallons per day
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
gw	groundwater
IRWMP	Integrated Regional Water Management Plan
ITRC	Irrigation Training and Research Center, California Polytechnic State University
IWTP	Industrial Wastewater Treatment Plant
M&I	Municipal And Industrial
MGD	million gallons per day
OCR	Optical Character Recognition
pdf	Adobe Acrobat Portable Document Format
PVWMA	Pajaro Valley Water Management Agency
RW	recycled water
RWQCB	Regional Water Quality Control Board
SCVWD	Santa Clara Valley Water District
SEIR	Supplemental Environmental Impact Report
SGMA	Sustainable Groundwater Management Act
SLDMWA	San Luis & Delta-Mendota Water Authority
SSCWD	Sunnyslope County Water District
USBR	U.S. Bureau of Reclamation
UWMP	Urban Water Management Plan
WRA	Water Resources Association of San Benito County
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WY	water year

San Benito County Water District

Annual Groundwater Report 2017

TODD GROUNDWATER

ANNUAL GROUNDWATER REPORT

WATER YEAR 2017

DECEMBER 2017

TODD GROUNDWATER

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WATER YEAR 2017

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ES EXECUTIVE SUMMARY

This Annual Groundwater Report for San Benito County Water District (District) describes groundwater conditions in the San Benito County portion of the Gilroy-Hollister basin. It documents water sources and uses, groundwater elevations and storage, and management activities for water year 2017. 2017 was a wet year; precipitation was the highest since 1998 and the imported water allocation was 100 percent of contract, the first time since 2006. The District used this available imported water, providing it to agricultural users, treating CVP water in the newly expanded Lessalt and newly completed West Hill Treatment Plants for municipal users, and—for the first time since 2007—percolating CVP water in off-stream ponds.

The District is continuing with long term water resource management planning, including compliance with the Sustainable Groundwater Management Act (SGMA). In May 2017, the District became the Groundwater Sustainability Agency (GSA) for the San Juan Bautista, Hollister, and Bolsa subbasins within San Benito County. The District will initiate preparation of a Groundwater Sustainability Plan (GSP) for these subbasins in 2018, beginning with outreach to stakeholders and the public. The District will also apply to the Department of Water Resources (DWR) for consolidation of these subbasins into a single groundwater basin; if approved, this will streamline the GSP process. GSP preparation must be completed by January 2022; subsequently, annual reports will continue to provide technical support for groundwater management and information to the public. The Annual Reports over the next few years will evolve through the GSP process to fulfill the annual reporting requirements of SGMA.

This year, a special section addresses the water balance, providing a summary of the last three years. The recovery of the basins over the past three years is clearly shown through the water balance. Most notably, from 2015 to 2017, inflows almost doubled and outflows decreased substantially, reflecting increased precipitation and CVP availability. Future water balances will be evaluated according to SGMA guidelines and with reference to DWR-defined basin boundaries, and will be presented in each GSP annual report. In addition, GSP preparation will include development of a refined hydrogeologic conceptual model, which describes how the groundwater system works and includes a water balance.

The District and Hollister Urban Area (HUA) partners continue to implement programs and projects that allow the available water supply to be used with efficiency. The West Hills Water Treatment Plant (WH WTP) is now operational. It increases the local capacity to treat imported CVP water for municipal use and allows the water agency partners to maximize imported water use when imported water is available. Recycled water continues to be delivered for landscape and agricultural irrigation, providing a consistent source of supply to augment groundwater pumping when imported water is not available.

Fewer wells were monitored in 2017 for both the groundwater elevation and water quality networks. The decreasing coverage and consistency of monitoring data has persisted for several years, with ramifications for tracking groundwater conditions. The District, committed to expanding the network of monitored wells (groundwater elevation and quality), recently took steps to stabilize the monitoring program in terms of consistency and areal coverage.

1 INTRODUCTION

The San Benito County Water District (District) was formed in 1953 by a special act of the State with responsibility and authority to manage groundwater. The special act allows the Board of Directors to require an annual investigation and report on groundwater conditions of the District and, as documented in Appendix A, specifies the minimum content of the report should the District choose to prepare one. Annual Reports focus on portions of the Gilroy-Hollister Basin within San Benito County. Consistent with the 2014 Sustainable Groundwater Management Act (SGMA), the District is the exclusive Groundwater Sustainability Agency (GSA) for these areas. The District, at its discretion, has also directed that specific Annual Reports include focused discussion of selected topics; this year, the focused topic is an update on the water balance.

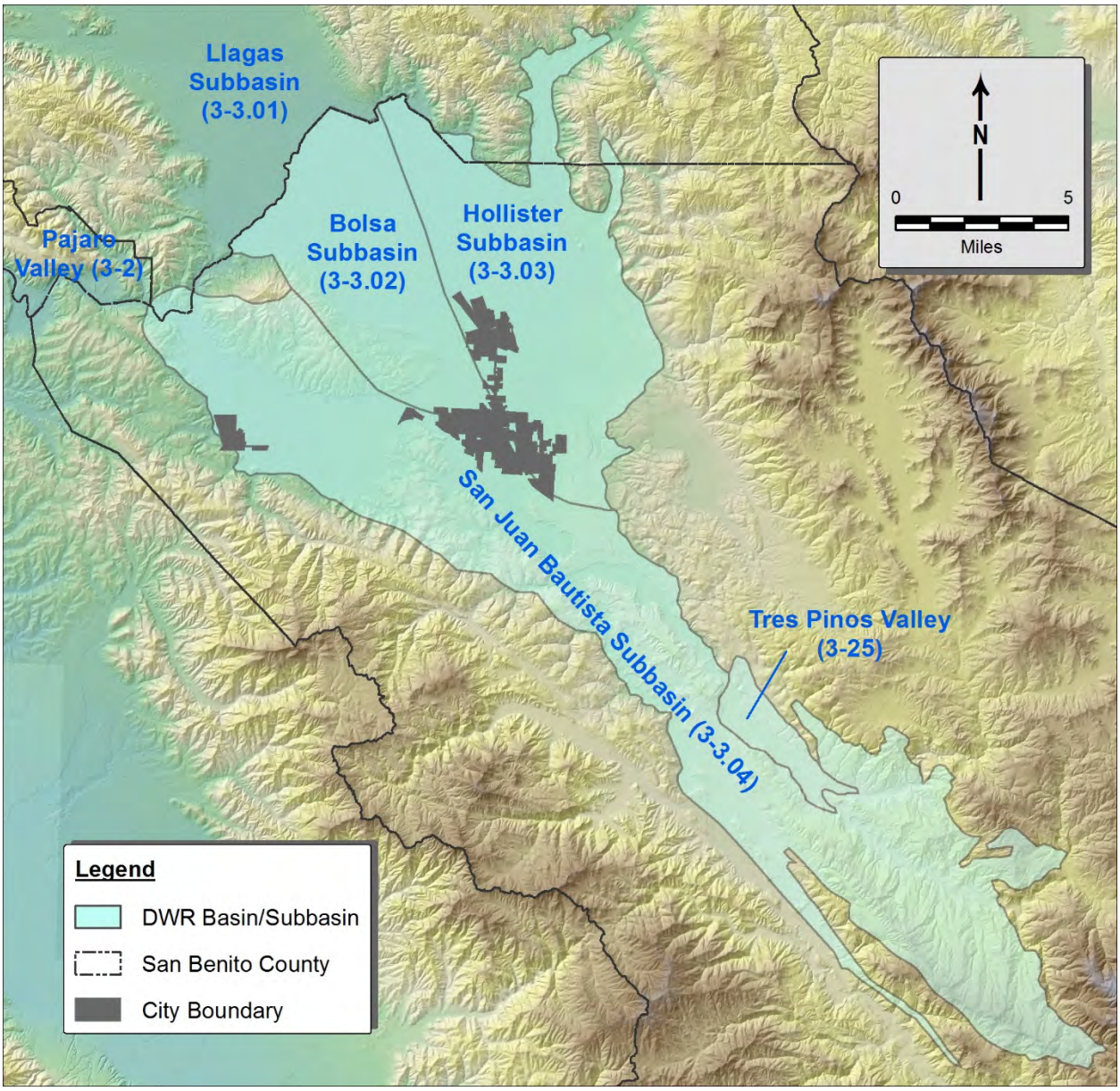
This Annual Report, prepared at the request of the District, documents water supply sources and use, groundwater elevations and storage, and District management activities from October 2016 through September 2017. It presents an overview of the state of the groundwater basin. It also conveys considerable information, including tables and figures, which are provided largely in Appendices B through E. Appendix F provides information on water rates and charges, Appendix G provides information on the methodology behind the water balance, Appendix H contains important SGMA documents, and Appendix I contains a list of acronyms.

Throughout this report, water volumes and changes in storage are shown to the nearest acre-foot (AF). These values are accurate to one to three significant digits (depending on the measurement). All digits are retained in the text to maintain as much accuracy as possible during subsequent calculations, but results should be rounded appropriately.

Acknowledgments

This report was prepared by Iris Priestaf, PhD, Maureen Reilly, PE, Chad Taylor, PG, CHg, and Gus Yates, PG, CHg of Todd Groundwater. We appreciate the assistance of San Benito County Water District staff, particularly Jeff Cattaneo, Garrett Haertel, Dustin Franco, and David Macdonald.

Figure 1. DWR Defined Basins and Subbasins.



Geographic Areas

This report focuses on the northern San Benito County portions of the Gilroy-Hollister groundwater basin, including the Bolsa, Hollister, and northern San Juan Bautista subbasins (Figure 1). The San Benito part of the basin encompasses the City of Hollister, City of San Juan Bautista, unincorporated residential areas, rangeland, and expansive areas of irrigated agriculture. The basin extends into southern Santa Clara County, where it includes the Llagas Subbasin and portions of the San Juan Bautista and Hollister subbasins. Santa Clara Valley

Water District (SCVWD) is the GSA for the basins within its jurisdiction. As respective GSAs, the District and SCVWD have agreed to collaborate in the SGMA management of the shared San Juan Bautista and Hollister subbasins, including preparation of a Groundwater Sustainability Plan (GSP).

The Department of Water Resources (DWR) originally defined the boundaries of the Bolsa, Hollister, and San Juan Bautista Subbasins largely based on geology (e.g., extent of alluvium). SGMA has established a process for boundary revision, which includes an application for local agencies to request revision of groundwater basin boundaries. The initial round of basin boundary modifications was conducted in 2016 with results published in *California's Groundwater* – Bulletin 118, Interim Update 2016. The next round is scheduled to begin January 1, 2018. The District is seeking consolidation of the three subbasins, and on September 20, 2017 passed Resolution No. 2017-17 to initiate the request process. This consolidation into one basin would be consistent with the intent of the District and SCVWD for collaborative management. This consolidation would continue the historical integrated management of these basins within San Benito County and formally extend this integrated management into SCVWD areas.

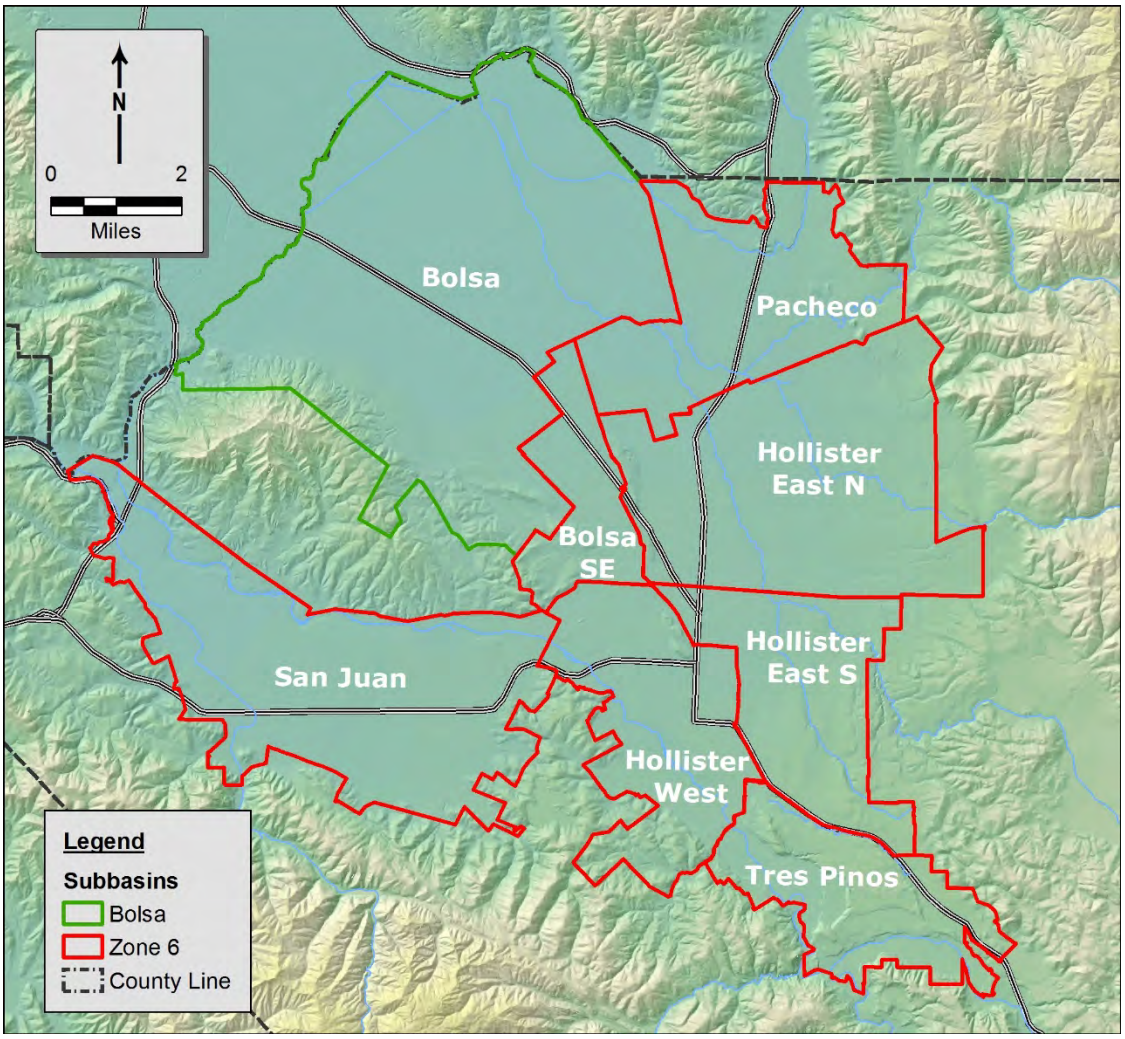
The jurisdiction of the District encompasses all of San Benito County, including all or portions of fourteen groundwater basins (see **Appendix C**). District management of water resources is focused on three Zones of Benefit, listed in **Table 1**.

For the purposes of District groundwater management and annual reporting, seven subbasins of the Gilroy-Hollister Basin were delineated in 1996: Bolsa, Bolsa Southeast (SE), Pacheco, Hollister East (North and South), Tres Pinos, Hollister West, and San Juan subbasins (**Figure 2**). These subbasins were defined based on hydrogeologic and significant local factors (i.e., Zone 6 boundaries) and used effectively for management and data collection for the past 19 years. Of the subbasins shown on **Figure 2**, only the Bolsa subbasin receives no CVP deliveries and relies entirely on local groundwater.

Table 1. District Zones of Benefit

Zone	Area	Provides
1	Entire County	Specific District administrative expenses
3	San Benito River Valley (Paicines to San Juan) and Tres Pinos River Valley (Paicines to San Benito River)	Operation of Hernandez and Paicines reservoirs and related groundwater recharge and management activities
6	San Juan, Hollister East, Hollister West, Pacheco, Bolsa SE, and Tres Pinos subbasins	Importation and distribution of CVP water and related groundwater management activities

Figure 2. Locations of SBCWD Subbasins



The 1996 subbasins differ from the subbasins defined by DWR and identified for compliance with SGMA. Upcoming GSP preparation will be accomplished in terms of the DWR defined basins and subbasins, recognizing that the Bolsa, Hollister, and San Juan Bautista subbasins may be consolidated. For GSP preparation and subsequent annual reporting, the water supply and demand information and groundwater data will need to be collected and presented consistent with DWR-defined basins.

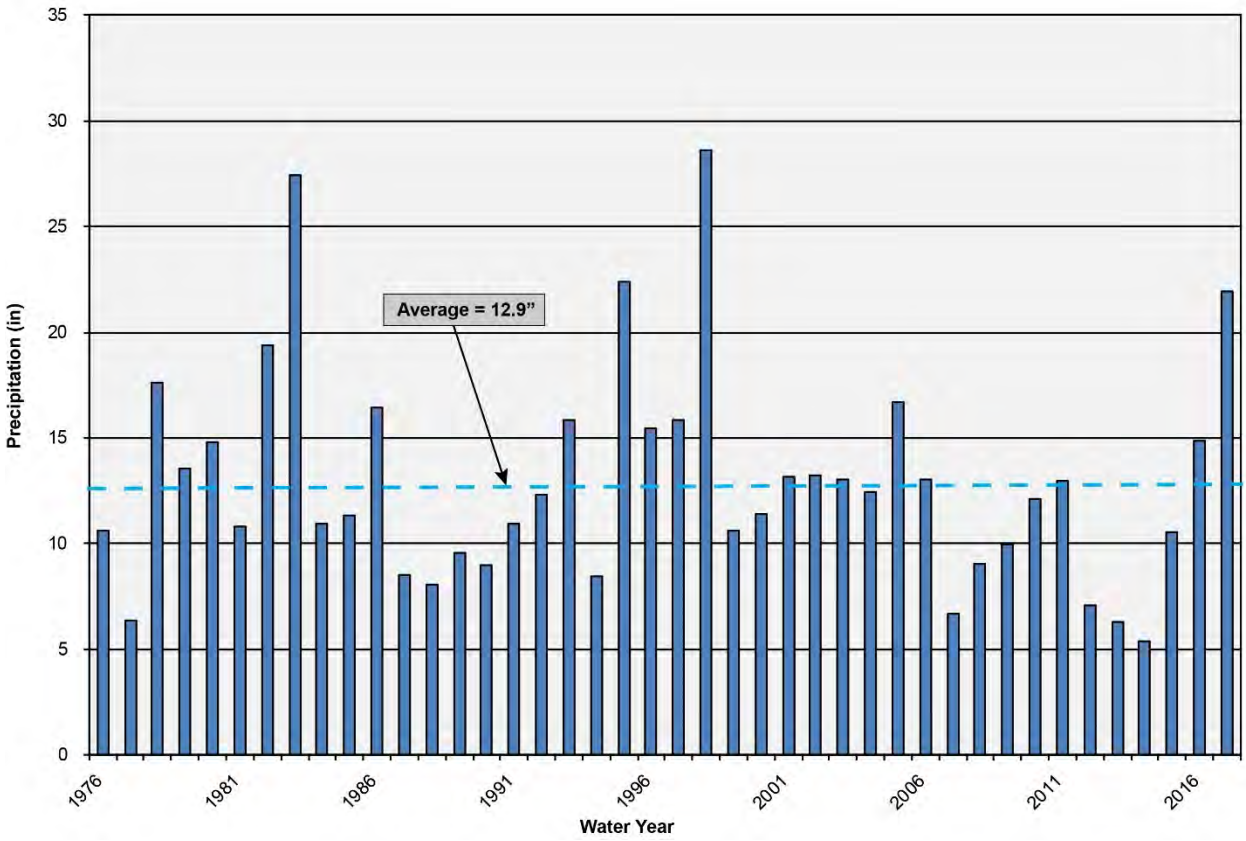
Climatic Conditions

Assessment of climatic conditions includes collection of climate data (rainfall and evapotranspiration), which are included in Appendix B. Local rainfall is compiled on a monthly basis and reviewed as an important and variable factor, affecting specific basin inflows (e.g., deep percolation) and outflows (groundwater pumping). Recognizing that drought often is

extensive across California, local dry years also may be indicative of regional drought and reduced CVP allocations. Accordingly, dry years often are characterized by increased groundwater pumping for agricultural irrigation to offset lack of rainfall and reduced CVP allocations.

In 2017, overall precipitation was 21.92 inches as shown in **Figure 3** and documented in **Appendix B**. This is the highest precipitation since 1998, amounting to 170 percent of the long-term average (1875-2017) of 12.9 inches. In addition, 2017 was only the second above-average rainfall year since 2011. As shown in **Figure 3**, most years have been below- or near-average rainfall and relatively few years have abundant rainfall, especially since 1998. These few years represent the best opportunity to recover from previous drought through replenishment of groundwater storage and to prepare for the next drought.

Figure 3. Annual Precipitation in Hollister, 1976 – 2017



Recovery of groundwater storage from previous drought has been accomplished historically with increased use of available imported water (with increased return flows) and with direct recharge (percolation) of local surface water. As documented later in this report, in 2017 CVP allocations were 100 percent, the first time since 2006, leading to significant groundwater elevation recovery.

2 MANAGEMENT ACTIVITIES

District water management activities, in addition to import and distribution of CVP water, include water resources planning, water conservation, and managed percolation of local surface water to augment groundwater. To track groundwater basin conditions, the District maintains a comprehensive monitoring program, including regular measurement of groundwater pumping, annual evaluation of groundwater storage change, and assessment of regional water quality.

Water Resources Planning

In 2017, the District was engaged in various projects, programs and planning efforts that address water supply and demand, water quality, and wastewater management.

West Hills Water Treatment Plant (WTP). The Hollister Urban Area Water Project (HUAWP) is a collaborative effort with local agencies to provide a secure and stable water supply to the region. As part of HUAWP, the provision of water treatment allows increased direct use of CVP for municipal and industrial (M&I) purposes; it also allows delivery of improved quality water to customers. West Hills WTP is the second surface water treatment plant to treat CVP imports and allows delivery to urban areas currently not served by the Lessalt Water Treatment Plant. West Hills came online in August 2017, with a design capacity of 4.5 MGD. The new WTP will increase the amount of treated M&I CVP water available to the Hollister Urban Area by 2,520 AFY to a total of 4,760 AFY. Eventually, these two facilities will have a combined capacity capable of treating the entire volume of the M&I CVP contract.

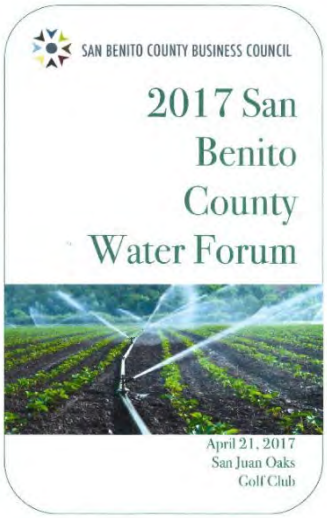
Hollister Urban Area
Water Project
Improving Our Water Future

Image Source: Benitolink.org

Urban Water Management Plan, Hollister Urban Area. The Urban Water Management Plan (UWMP), prepared through the collaborative effort of the District, Sunnyslope County Water District (SSCWD) and the City of Hollister, was completed in 2016 and submitted to DWR**.** In September 2017, the HUA agencies received official notice from DWR that the UWMP had been reviewed and found to meet all requirements. The UWMP provides detailed information on the current and future water supply and demand for the Hollister Urban Area, and provides a comparison of supply and

demand in normal years plus single-year and multi-year droughts. As documented in the UWMP, the Hollister Urban Area has adequate supplies to meet demands. The UWMP also documents local water conservation measures (see below).

Recycled Water Project. The District has worked cooperatively for years with the County, City of Hollister, and SSCWD to implement recycled water use. Current recycled water use includes City of Hollister landscape irrigation. In June 2016, recycled water also was delivered to agricultural users in the Hollister East subbasin area. A total of 366 AF was delivered in Water Year 2017 for landscape and agricultural irrigation.



Water Forum. In April 2017, the District participated in the 2017 San Benito County Water Forum. The Forum, convened by the San Benito County Business Council, included speakers from the Farm Bureau, local water agencies, political representatives, and more. This collaborative effort facilitates communication among a diversity of basin stakeholders and supports outreach for the SGMA process.

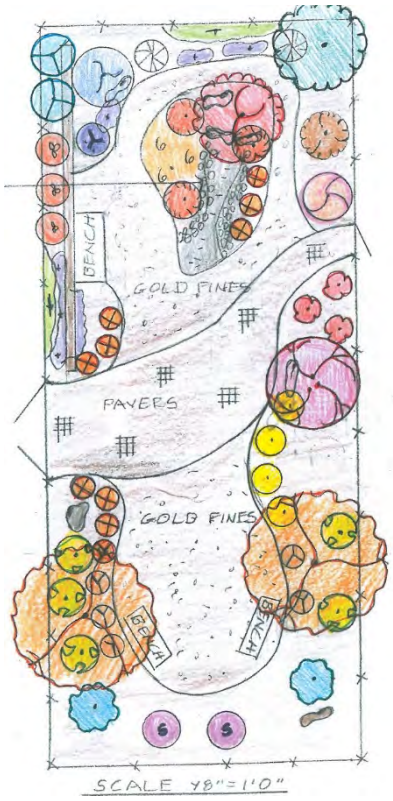
Water Conservation

Water conservation is an important tool to manage demands on the groundwater basin. During the most recent drought, the state mandated that water retailers reduce their demand. This state-ordered demand reduction, together with the expansion of ongoing water conservation efforts, successfully lowered water demand. Water conservation efforts in San Benito County are conducted mostly through the Water Resources Association (WRA), composed of representatives from the District, City of Hollister, City of San Juan Bautista, and Sunnyslope County Water District.

Ongoing Conservation. The State has lifted mandatory water demand reductions for agencies; nonetheless, the Hollister Urban Area continues voluntary demand reductions. The managers at Hollister and SSCWD plan to maintain water demand reductions; their goal for total usage is 15 percent less than 2013 demands. Currently, the Hollister Urban Area is exceeding this goal with about 22 percent less than 2013 demands.

Water Shortage Contingency Plan (WSCP). As part of the Urban Water Management Plan (UWMP), Hollister, SSCWD, and the District developed a joint WSCP. The plan includes many permanent prohibitions on water waste (including using water to clean paved surfaces and watering lawns within 48 hours of rain). In addition, the plan details what water conservation measures are triggered during drought conditions.

Irrigation Education. The District, in collaboration with the WRA, continues to offer a series of classes on irrigation efficiency and other agriculture practices. Since 2009, these workshops provide concepts, tools, and examples for optimizing irrigation and nitrogen management efficiency in row, tree, and greenhouse crop production.



Water Wise Demonstration Garden and Plans. WRA maintains a demonstration garden at Dunne Park in downtown Hollister (corner of 6th & Powell) (see right inset). Their website offers a landscape design and brochure to help educate visitors on drought resistant landscaping. The WRA website also provides three sample Water Efficient Landscape Plans available for download.

Turf Removal Program. The WRA no longer offers Turf removal programs but encourages customers to participate in the State's Save Our Water turf programs.

Public Outreach. WRA continues to educate the public about the regional water system and water use efficiency. Its website is regularly updated and for example, currently includes a video that summarizes the history of local water development, the role of the local groundwater basin, and the benefits of the Hollister Urban Area Water Project. WRA has given presentations to local school and lead school groups to the local WTP and WWTP, reaching over 400 students in autumn 2016 alone. Other outreach programs have provided water conservation outreach to 75 high school students this year.

Other ongoing water conservation programs involve irrigation rebates, toilet replacements, education program and outreach. These water conservation programs, while successfully reducing water demand, are being continued and diversified to encourage the public to continue to use water wisely.

Managed Percolation

Percolation of Local Surface Water. In most years, local surface water released from Hernandez and Paicines Reservoirs is percolated along the San Benito River and Tres Pinos Creek. Releases are managed to maximize percolation along the stream channels of the San Benito River and Tres Pinos Creek and to avoid any losses out of the basin.

In 2017, the District completed preparation of an operations planning tool to create annual plans for operation of SBCWD's Hernandez and Paicines Reservoirs and for re-diversion of Hernandez Reservoir releases to Paicines Reservoir at the San Benito River Diversion. This tool standardizes and facilitates the annual effort to plan Hernandez operations under differing hydrologic and water supply conditions and provides for coordinated management of surface water storage and groundwater storage.

Hernandez Reservoir was filled to near-capacity in 2017 and releases in 2017 were the highest since 1998 with 23,191 AF released. Releases from Paicines were 2,407 AF, the highest since 2010.

Percolation of Wastewater. Wastewater is percolated by the City of Hollister at its Domestic and Industrial plants, by SSCWD at its Ridgemark Facilities, and by Tres Pinos Water District. Recent changes in operation of the wastewater facilities (including increased water recycling) and decreased municipal water use have decreased the volume percolating to the groundwater. Information about the amount of groundwater recharged from these wastewater facilities is found in Appendix D.

Percolation of CVP Water. In 2017, the District percolated CVP imports for the first time since 2008, using two off-stream basins. The Union Road pond (located near the San Benito River in Hollister West subbasin) percolated 2,209 AF beginning in March 2017, while the Frog Pond in Pacheco subbasin was used to percolate 340 AF April through September.

In the past, CVP percolation was used regularly to recharge the groundwater basin. CVP percolation peaked in 1997 and was reduced subsequently in response to the successful recovery of the groundwater basin from overdraft. In 2017, the available groundwater storage, on-hand CVP imports, and suitable off-stream ponds provided a good opportunity to resume percolation activities. Direct in-stream recharge of CVP water is not planned because of concerns for release of invasive Dreissenid mussels. A table of historical percolation is found in Appendix D.

3 SGMA

The Sustainable Groundwater Management Act (SGMA), the most significant groundwater legislation in California history, requires sustainable management by local agencies of DWR-defined groundwater basins. In San Benito County, the basins subject to SGMA are the three subbasins of the Gilroy-Hollister Basin (Bolsa, Hollister and San Juan Bautista subbasins, respectively DWR Nos. 3-3.02, 3-3.03, and 3-3.04) and the Pajaro Valley Groundwater Basin (DWR No. 3-2, mostly in Santa Cruz and Monterey counties; see Figure 1).

The Gilroy-Hollister subbasins must have Groundwater Sustainability Plans (GSPs) in place by 2022, while the Pajaro Valley Basin, which has been designated as critically overdrafted, has a GSP due date of 2020. Pajaro Valley Water Management Agency (PVWMA) historically has managed the Pajaro Valley Basin and has submitted its Basin Management Plan Update to DWR as an alternative plan to fulfill SGMA. The Basin Management Plan Update contains a suite of projects and programs intended to halt seawater intrusion and balance the entire Pajaro Valley Groundwater Subbasin prior to the 2040 SGMA deadline for sustainability.

With regard to the three Gilroy-Hollister subbasins, the District has been actively preparing for SGMA since 2015 and in 2017 made significant progress toward SGMA compliance. The District became the Groundwater Sustainability Agency (GSA) for the Bolsa, Hollister and San Juan Bautista subbasins within San Benito County, developed an agreement with SCVWD for GSP preparation, and applied to DWR for grant funding to support GSP preparation, among other efforts.

San Benito County Water District GSA

On February 8, 2017, the Board of Directors convened a special hearing regarding the District's decision to become the GSA for the Bolsa, Hollister and San Juan Bautista subbasins within San Benito County and approved Resolution No. 2017-03 for the District to become the GSA. The resolution, reproduced in **Appendix H**, summarizes the authority of the District to be a GSA and its continuing commitment to manage surface water and groundwater resources within its jurisdiction.

On February 24, the District posted its notice to become a GSA (including the resolution and other required information) on DWR's SGMA Portal (http://sgma.water.ca.gov/portal/gsa/print/89) and after a required 90-day waiting period, was established as the exclusive GSA for the Bolsa, Hollister and San Juan subbasins within San Benito County.

Similarly, PVWMA is exclusive GSA for its jurisdiction in Pajaro Valley Groundwater Basin and SCVWD is exclusive GSA for groundwater basins in its jurisdiction, including the Llagas Basin (DWR No. 3-3.01) and portions of the Hollister and San Juan Bautista subbasins in Santa Clara County.

Agreement with Santa Clara Valley Water District

As noted above, the District is the GSA for the Bolsa Subbasin. It is also the GSA for the Hollister and San Juan Bautista Subbasins within San Benito County, while SCVWD is the GSA for the portions of the Hollister and San Juan Bautista subbasins in Santa Clara County. On July 5, 2017, the District and SCVWD executed a Memorandum of Understanding (MOU), which establishes their respective roles and responsibilities in preparing a GSP for the two shared subbasins (termed therein as Common Basins). The MOU, attached in **Appendix H,** is important in providing for cooperative management of the subbasins and ensuring that the entirety of the subbasins is within one GSA or the other; this is one of the requirements of SGMA.

While management of the Hollister and San Juan Bautista Subbasins is shared, the Bolsa Subbasin and Llagas Subbasin are neighboring basins that are managed respectively by the District and SCVWD, with ongoing cooperation and data sharing. For example, groundwater elevation data along the Bolsa-Llagas boundary are regularly shared to analyze groundwater flow across the boundary. Regarding SGMA, the District and SCVWD also shared information about basin boundary modifications requested by SCVWD for Llagas Basin and DWR modifications along the San Benito-Santa Clara county line.

Grant Funding

In November 2017, the District applied for a Sustainable Groundwater Management Planning (SGWP) Grant for GSP preparation that would address the three subbasins as defined by DWR (see Figure 1). However, historical groundwater management has focused on highly developed areas that were defined locally as subbasins in 1996 (Figure 2). Comparison of Figures 1 and 2 indicate that use of DWR-defined basins instead of SBCWD-defined basins will effectively double the managed area. The geographic expansion means that funding is needed for extension of the following:

- Data Management System, including GIS mapping and data sets (e.g., soils, land use, wells, climate)
- Water resources monitoring program (e.g., groundwater elevations, pumping, quality)
- Groundwater analyses and maps of historical/current conditions (e.g., change in groundwater storage)
- Numerical groundwater flow model
- Outreach to stakeholders, including DACs who have not yet been engaged in management
- Consideration of issues, objectives, activities, and funding mechanisms for areas not addressed previously.

In addition, while historical management provides a good foundation for a GSP, SGMA entails a quite rigorous, systematic process with significant requirements. Because SGMA is new and

necessary and because more extensive basin areas will be involved, collaboration and outreach will need to be amplified. Accordingly, the District applied for a SGWP Grant to assist this effort. The District should be notified of the grant application status as early as December 2017.

Application for Groundwater Basin Consolidation

The three subbasins (Bolsa, Hollister and San Juan Bautista) are defined officially by DWR as separate subbasins, each of which needs to be addressed with a GSP. While recognizing these subbasins, and using its own subbasins for management purposes, the District historically has managed these basins in a unified and comprehensive manner. This recognizes that the subbasins are not only contiguous, but hydraulically connected and linked by management actions that pass over subbasin boundaries. Moreover, the jurisdictions of two major water retailers, City of Hollister and SSCWD, overlap subbasin boundaries. Accordingly, the 1998 and 2004 Groundwater Management Plans (prepared by the District in collaboration with local organizations) addressed the three basins together, with comprehensive and coordinated analyses, monitoring, management, reporting, and outreach. The District's annual groundwater reporting also has addressed the three subbasins in unified reports. Given that historical management that has been effective for decades, preparation of a single GSP for all three subbasins would be consistent with historical management and cost-effective.

Accordingly, on September 20, 2017 the District Board of Directors passed Resolution No. 2017-17 to begin the process of a Basin Boundary Modification Request to DWR for consolidation of the three subbasins into one basin. This process will continue into 2018; the period for submitting a request is open on January 1 for six months, followed by a 30-day public comment period, and decisions by DWR in Fall 2018. Consistent with SGMA, the District is planning preparation of three concurrent GSPs, but will be able to consolidate its GSP preparation if the three basins are united.

The definition of subbasins within a single basin can be useful; it recognizes local conditions and concerns. In fact, the District historically has used such subbasins, as shown in the Annual Reports (see Figure 2). Similarly, SGMA recognizes the importance of local conditions and concerns and thus allows definition of *Management Areas* that can be operated with area-specific minimum thresholds and management objectives, provided basic consistency across the basin. Such management areas will be considered as part of the GSP.

SGMA Concepts

This and previous Annual Groundwater Reports have provided information on the overall process required by SGMA in terms of the identification of groundwater basins subject to SGMA (i.e., the medium-priority Bolsa, Hollister, and San Juan Bautista subbasins), the overall process (e.g., establishing a GSA and preparing a GSP), and the timeline (i.e., preparing the first GSP by 2022, with annual reports and updates on a five-year schedule thereafter). This section introduces basic SGMA concepts about what sustainability is and how it is defined, so that the GSA, local agencies, and stakeholders know what it is, how it is measured, and when it is achieved and maintained.

This is a very brief introduction, and for more information, the interested reader is directed to the Department of Water Resources website http://www.water.ca.gov/groundwater/sgm/index.cfm and the Best Management Practice (BMP) document regarding Sustainable Management Criteria: http://www.water.ca.gov/groundwater/sgm/pdfs/BMP_Sustainable_Management_Criteria_2017-11-06.pdf. This BMP document currently is draft and is the topic of a series of DWR workshops, but provides useful definitions, which are summarized below.

First, SGMA defines ***sustainable groundwater management*** as the management and use of groundwater in a manner that can be maintained without causing undesirable results. ***Undesirable results*** are defined as one or more of the six effects illustrated on the following page. All six are shown, but it is recognized that seawater intrusion is not applicable to the inland Gilroy-Hollister subbasins.

A ***minimum threshold*** is the quantitative value that represents the groundwater conditions at a representative monitoring site that, when exceeded individually or in combination with minimum thresholds at other monitoring sites, may cause an undesirable result(s) in the basin. GSP preparation will need to set minimum thresholds at representative monitoring sites for each applicable sustainability indicator after considering the interests of beneficial uses and users of groundwater, land uses, and property interests in the basin. Minimum thresholds will be set at levels that do not impede adjacent basins (i.e., Llagas) from meeting their sustainability goals.

The six icons represent ***sustainability indicators***, which are the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, become undesirable results. The significant and unreasonable occurrence of any of the six sustainability indicators constitutes an undesirable result; a GSP must define and document the conditions at which each of the six sustainability indicators become significant and unreasonable, including the reasons for those definitions. Sustainability indicators are subject to quantification and the respective metrics are defined in the GSP Regulations.

Sustainability Indicators

Chronic lowering of **groundwater levels** indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Groundwater decline during drought is not considered chronic if extractions and groundwater recharge are managed to ensure that reductions in groundwater levels or storage during drought are offset by increases during other periods. This is measured by groundwater levels.

Significant and unreasonable reduction of **groundwater storage**; the metric is volume of groundwater storage.

Significant and unreasonable **seawater intrusion**, measured by a chloride concentration isocontour.

Significant and unreasonable degraded **water quality**, including the migration of contaminant plumes that impair water supplies. This is measured by the migration of plumes, number of water supply wells affected, the volume of contaminated groundwater, and/or the location of a contaminant isocontour.

Significant and unreasonable land **subsidence** that substantially interferes with surface land uses; this is measured as the rate and extent of land subsidence.

Depletions of **interconnected surface water** that have significant and unreasonable adverse impacts on beneficial uses of the surface water. The metric is the volume or rate of surface water depletion.

Measurable objectives are quantitative goals that reflect the basin's desired groundwater conditions and allow the GSA to achieve the sustainability goal within 20 years. Measurable objectives are set for each sustainability indicator at the same representative monitoring sites and using the same metrics as minimum thresholds. Avoidance of the defined undesirable results must be achieved within 20 years of GSP implementation. SGMA recognizes that some basins may experience undesirable results within the 20-year period (particularly if the basin has existing undesirable results as of January 1, 2015); however, that does not, by itself, necessarily indicate that a basin is not being managed sustainably, or that it will not achieve sustainability within the 20-year period. Nonetheless, GSPs must clearly define a planned pathway to reach sustainability in the form of interim milestones, and show actual progress in annual reporting.

In addition to the measurable objective, ***interim milestones*** must be defined in five-year increments at each representative monitoring site using the same metrics as the measurable objective. These interim milestones are used by GSAs and DWR to track progress toward meeting the basin's sustainability goal. Interim milestones will be coordinated in the GSP with projects and management actions proposed by the GSA to achieve the sustainability goal.

A GSA may wish to define ***management areas*** for portions of its basin to facilitate groundwater management and monitoring. Management areas may be defined by natural or jurisdictional boundaries, and may be based on differences in water use sector, water source type, geology, or aquifer characteristics. Management areas may have different minimum thresholds and measurable objectives than the basin at large and may be monitored to a different level. However, GSAs in the basin must provide descriptions of why those differences are appropriate for the management area.

Lastly, the ***sustainability goal***, developed as part of the GSP, will succinctly state the management objectives and desired conditions of the groundwater basin, how the basin will get to that desired condition, and why the measures planned will lead to success.

Agency Coordination and Public Outreach

Recognizing the collaborative nature of SGMA, the District has continued its discussion of SGMA issues with other agencies, including water retailers in San Benito County (City of Hollister, Sunnyslope County Water District, City of San Juan Bautista, Aromas Water District, and Pacheco Pass Water District), GSAs in nearby basins (e.g., SCVWD and PVWMA), and the San Benito County Board of Supervisors, among others. The District website at www.sbcwd.com provides announcements, reports, newsletters, and basic information on San Benito County water resources. Public outreach included the preparation and presentation of the 2016 Annual Groundwater, discussions with non-governmental organizations such as the San Benito County Farm Bureau, and presentations as part of the San Benito County Water Forum, a regular gathering sponsored by the San Benito County Business Council. The April 21, 2017 Forum included presentations on Our Groundwater, Groundwater Sustainability Planning, and the Hollister Urban Area Water Project.

Groundwater Sustainability Plan (GSP) Preparation

The District has developed a work plan, schedule, and budget for systematic GSP preparation in collaboration with local water providers, SCVWD, stakeholders and the public. This will be a multi-year effort that will begin in early 2018. The main elements of a GSP will include:

Outreach and Stakeholder Engagement. A Communication Plan will describe how the District will make decisions as part of the GSP, engage and inform the public, and recognize beneficial uses and users in relation to the GSP. This is planned to include creation of a SGMA website and establishment of a SGMA Advisory Forum (SAF). In addition, a series of public workshops is planned to engage the larger community.

Compilation and Review of Data. The District has been collecting and compiling groundwater data annually including groundwater elevations, water quality, and water use for the Annual Groundwater Reports. These data are compiled in a relational database, including capabilities for queries to quickly check and summarize data. The effort for the GSP will be to review and update the current data management system (with respect to SGMA requirements and DWR Best Management Practices), to identify data gaps, and to support the GSP monitoring program. Available information will support the entire GSP including analysis of the hydrologic setting, groundwater conditions, sustainability criteria, and potential projects and management actions.

Hydrogeologic Conceptual Model. The hydrogeologic conceptual model (HCM) provides a description of the structural and physical characteristics that govern groundwater occurrence, flow, storage, and quality. In brief, the HCM describes how the local surface water-groundwater system works. The HCM and an accompanying analysis of current groundwater conditions will address the entire area of the three subbasins (Bolsa, Hollister, and San Juan Bautista).

Water Budget. Water budgets will be quantified for historical and current conditions per SGMA regulations. This will involve use of past studies, the existing numerical model, and recent monitoring data and investigations. Water balances developed by SCVWD for the adjacent Llagas Basin also will be reviewed to promote a consistent approach. The GSP Water Budget will build on past Annual Report water balances and include use of available data and best available science to quantify inflows, outflows, and change in storage, including sustainable yield and potential overdraft.

Update and Extension of Existing Groundwater Model. SGMA recognizes that groundwater models are valuable tools to explore how the groundwater systems works, to assess potential management actions and projects, and to demonstrate how a GSP will achieve sustainable basin operation. The District has a numerical model that has been developed, periodically updated, and used for various scenarios (Yates, 2001). This existing MODFLOW model (and linked surface hydrology model and pre-processing utility programs) will be updated, expanded to entirely cover all three subbasins, and improved for application in the GSP.

Sustainability Criteria. While the District has a long history of groundwater management, such management has not included systematic quantification of undesirable results, minimum thresholds, or measurable objectives to the extent required by SGMA. Defining these specific sustainability criteria, eliciting input from the SGMA Advisory Forum and stakeholders, and creating a detailed plan for future sustainability will be a focused effort.

Describe Management Actions and Projects. As part of the GSP process, the District will describe management policies, programs, and projects for sustainable management. Already recognized and proposed/planned actions and projects will be summarized in terms of applicability to sustainability criteria. Additional actions and projects likely will be identified through the GSP process as local agencies and stakeholders consider undesirable results and thresholds.

Develop Monitoring Networks and Protocols. This District will establish the GSP monitoring network and protocols that will: 1) provide data to the hydrogeologic conceptual model and water budget and future model updates, 2) provide tracking and early warning regarding groundwater conditions and undesirable results, and 3) demonstrate progress toward and achievement of sustainability. Consistent with monitoring BMPs, the monitoring network will collect data of sufficient quality, distribution, and frequency to characterize groundwater and related surface water conditions and to track changes, including short-term, seasonal, and long-term trends. The overall approach will involve development of a comprehensive monitoring program that can be subdivided by subbasin if required for evaluation.

4 WATER USE

Water Supply Sources

Four major sources of water supply are available for municipal, rural, and agricultural land uses. These are summarized below; for more data and graphs see Appendix E.

- **Local Groundwater.** Groundwater is pumped by private irrigation and domestic wells and by public water supply retailers. The District does not directly produce or sell groundwater, but has the responsibility and authority to manage groundwater throughout San Benito County. This report focuses on the portion of the Gilroy-Hollister groundwater basin (DWR Basin 3-3) within San Benito County and, consistent with previous Annual Reports, addresses the six District-defined subbasins (San Juan, Bolsa SE, Pacheco, Hollister East and West, and Tres Pinos) with measured supplies. Bolsa Subbasin relies solely on groundwater, which is not measured there.
- **Imported Water.** The District purchases Central Valley Project (CVP) water from the U.S. Bureau of Reclamation (USBR). The District has a 40-year contract (extending to 2027) for a maximum of 8,250 AFY of M&I water and 35,550 AFY of agricultural water.
- **Recycled Water.** Water recycling began in 2010 with landscape irrigation at Riverside Park. Recycled water currently is provided to selected landscape irrigation and agricultural users and recycled water use amounted to 366 AF in WY 2017. This source is reliable during drought and helps secure a sustainable water supply.
- **Local Surface Water.** Surface water is not used directly for potable or irrigation use in the basin, but creek percolation is a significant source of groundwater recharge. Releases from the District's Hernandez and Paicines reservoirs were substantial in 2017. Stormwater capture is effectively limited to some diversion to the Hollister Industrial WWTP (via a combined sewer system) with subsequent treatment and discharge to percolation and evaporation ponds. This is included in percolation totals in Appendix D.

Available Imported Water

The District distributes CVP water to agricultural and M&I customers in Zone 6. For USBR contract year 2017 (March 2017 - February 2018), both agriculture and M&I customers were provided the full contract allocation, for the first time since 2006. **Table 2** shows the contract entitlements and recent allocations (SLDMWA 2017). Note that USBR contract years are March through February, so water year 2017 overlapped two contract years.

Table 2. CVP Entitlements and Allocations, USBR Contract Years 2016-2017

March 2016 - February 2017

	Contract Amount	% Allocation	Allocation Volume (af)
Agriculture	35,550	5%	1,912
M&I	8,250	55%	4,538
TOTAL	**43,800**		**6,450**

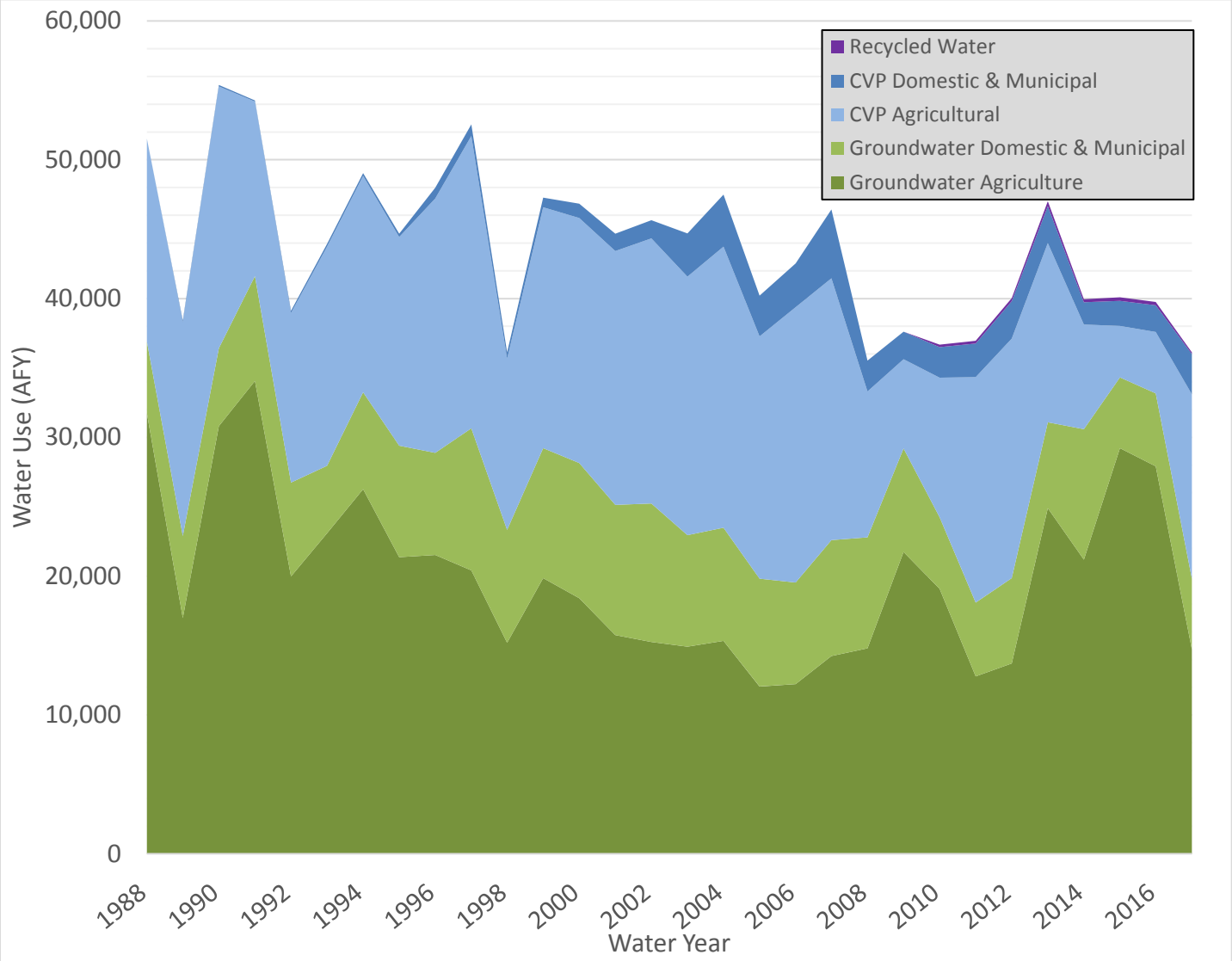
March 2017 - February 2018

	Contract Amount	% Allocation	Allocation Volume (af)
Agriculture	35,550	100%	35,550
M&I	8,250	100%	8,250
TOTAL	**43,800**		**43,800**

Water Use

In 2017, Zone 6 total water use decreased from water year 2016, most likely due to higher-than-average precipitation and lower evapotranspiration. Total water use was 36,378 AF, a nine percent decline from 2016. **Figure 4** shows significant changes in the portion of supply from imported water and groundwater in recent years. For example, in 2016 only 16 percent of supply was from CVP, and in 2017, CVP supply increased to 45 percent. Such changes are expected and represent conjunctive use of supplies, as groundwater pumping by agricultural users increases during dry years when import allocations are low and decreases in wet years when imported water is available.

Figure 4. Total Zone 6 Water Use by Source and Use 1988-2017 (AFY)



Distribution of Demand by Source and Use

Water year 2017 saw a significant increase in the use of CVP water, increasing to 2.5 times last year's total volume. Recycled water deliveries remained generally consistent at one percent of total supply. **Table 3** shows the total Zone 6 water supplied by CVP, groundwater, and recycled water sources.

Table 3. Total Zone 6 Water Use by Source for Water Years 2016 and 2017 (AF)

	CVP		Groundwater		Recycled Water		Total	
	2016	2017	2016	2017	2016	2017	2016	2017
Agriculture	4,434	13,288	27,912	14,727	246	258	32,591	28,273
M&I	1,914	2,909	5,251	5,088	253	108	7,417	8,105
TOTAL	**6,347**	**16,197**	**33,162**	**19,815**	**499**	**366**	**40,008**	**36,378**

Agricultural water use declined slightly. Municipal and domestic use increased slightly, but remained lower than the average over the period of record, mostly because of water conservation. In 2017, groundwater represented 54 percent of total supply, mostly reflecting increases in CVP imports for agricultural use. **Figure 5** illustrates that since 1993, groundwater has averaged 62 percent of supply with periodic increases due to drought and reduced CVP allocations.

Figure 5. Percent of Supply by Source, 1993- 2017

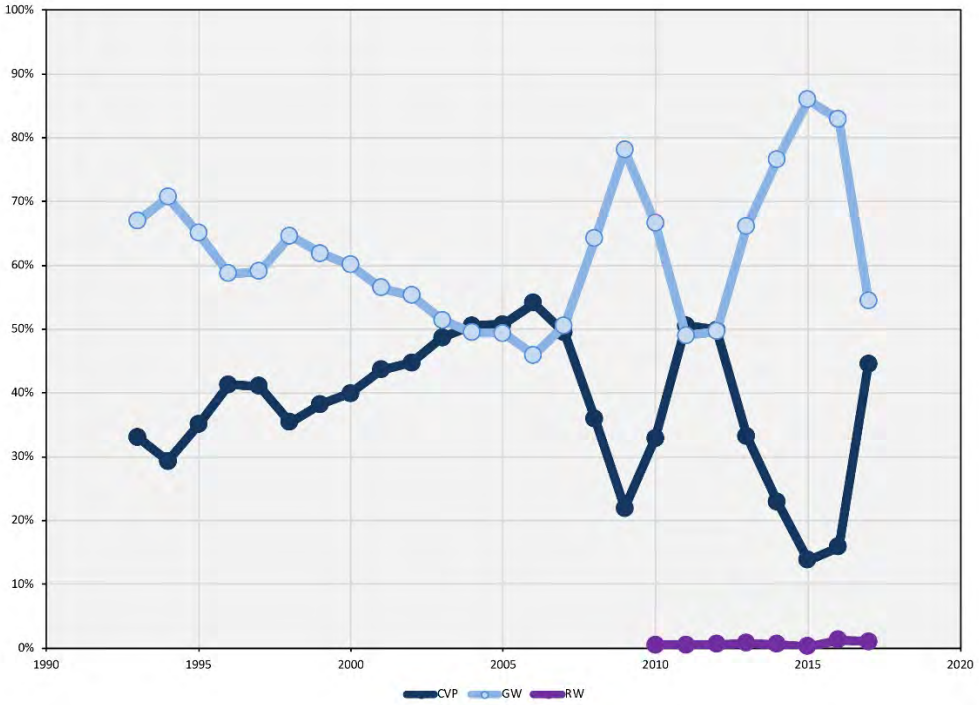
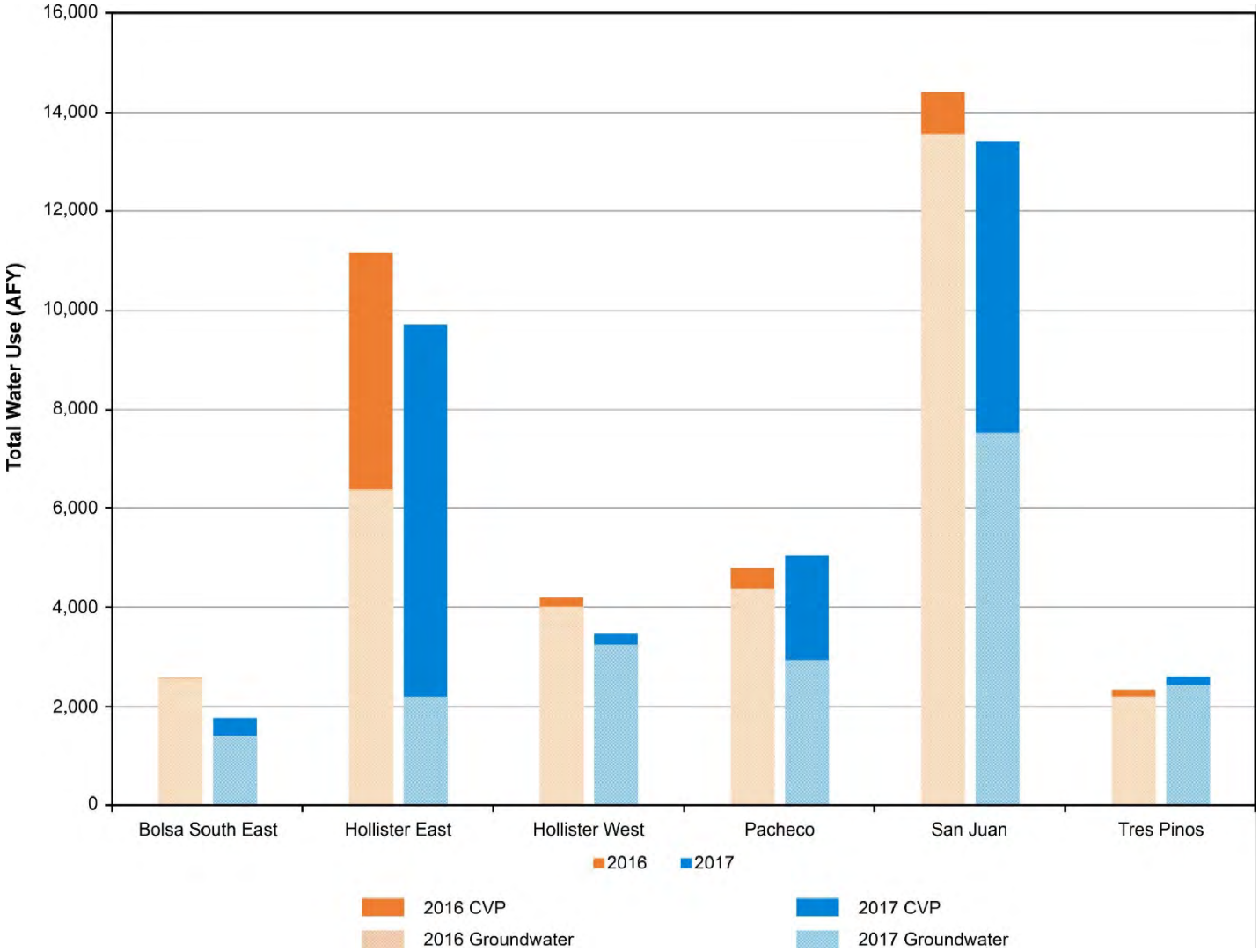


Figure 6 illustrates the change from 2016 to 2017 in water supply source by subbasin. The Bolsa Subbasin is not depicted because its sole source is groundwater and is not measured. The orange bars represent water supply for water year 2016 and the blue bars represent water supply for 2017. The lower portion of each bar represents groundwater as a source of supply and the upper portion is CVP supply. Recycled water is a relatively limited supply and is not included in this graph. In 2016, when CVP allocations were lower, groundwater made up 84 percent of total supply. In 2017, when CVP allocations were 100 percent of contract, many subbasins show a high portion of supply from CVP imports. This change in the source of supply is particularly evident in Hollister East and San Juan, two intensively farmed subbasins. Both subbasins saw a significant decrease in groundwater levels during the drought when growers relied on the groundwater supply to make up for the limited CVP imports. In wet years when imports are available, these basins should maximize CVP use; this type of conjunctive use, termed "in-lieu recharge," allows the groundwater reserves to replenish.

Figure 6. Supply by Source and Subbasin, 2016 and 2017



Distribution by Subbasin

Relative water use in the six subbasins remained similar as in previous years, with groundwater making up a large portion of supply in Bolsa Southeast, San Juan, and Tres Pinos subbasins. **Table 4** shows the water use by user, and water type for each subbasin. Graphs showing total water use by water source are available in Appendix E.

Table 4. Zone 6 Water Use in Water Year 2017 (AF)

	CVP Water		Groundwater		Recycled Water	
Subbasin	Agriculture	Domestic & Municipal	Agriculture	Domestic & Municipal	Agriculture	Landscape Irrigation
Bolsa Southeast	365	0	1,399	14	66	0
Hollister East	5,372	2,115	2,192	17	192	0
Hollister West	14	203	1,324	1,931	0	108
Pacheco	2,060	36	2,904	45	0	0
San Juan	5,354	499	6,562	980	0	0
Tres Pinos	121	56	347	2,100	0	0
TOTAL	**13,288**	**2,909**	**14,727**	**5,088**	**258**	**108**

5 GROUNDWATER ELEVATIONS

In October 2017, groundwater elevations increased in most areas of the basin, for the first time since 2008. While some subbasins showed small groundwater elevation decreases, overall groundwater in storage increased. Groundwater elevation increases were greatest in the Bolsa, Pacheco, Bolsa SE, and Hollister West subbasins.

In reviewing groundwater elevations and trends, it is important to recognize the conjunctive use of imported water and groundwater supplies and the role of groundwater storage. In dry years, like 2012 through 2015 with reduced CVP imports, groundwater pumping provides most of the supply, but groundwater storage is reduced. In the less-frequent wet years, like 2017, the District must replenish groundwater reserves to prepare for the next drought. This has been achieved since the 1970s mostly through provision of imported CVP water instead of groundwater pumping (in-lieu recharge) and through the District's percolation activities. However, CVP water is likely to become less dependable (for example, due to climate change), which presents a challenge to long-term sustainability.

To track groundwater storage changes, the analysis of groundwater elevations depends on a consistent network of reliable wells. The number of wells in the District's groundwater monitoring program for the autumn was at an all-time low, increasing the uncertainty of a subbasin-wide storage change calculations. In addition, the set of wells monitored was different from that monitored in previous years in some key locations. This means that storage change cannot be computed reliably. The District currently is assessing the monitoring network and increasing efforts to record groundwater elevations in a stable network of wells on a quarterly basis. In 2018, along with SGMA outreach, the District will begin searching for new wells to add to the network in areas not currently managed by the District. If for some reason, wells are no longer part of the network, they should be replaced as soon as possible with a nearby, comparably-constructed well that can serve as a permanent addition to the network.

The District should continue to manage groundwater resources for substantial and rapid recovery in wet years, recognizing that most years are average to dry and wet years are much less frequent (see Figure 3). Additional information on groundwater elevations (including profiles of basin cross sections and depth to water contours) are included in Appendix C.

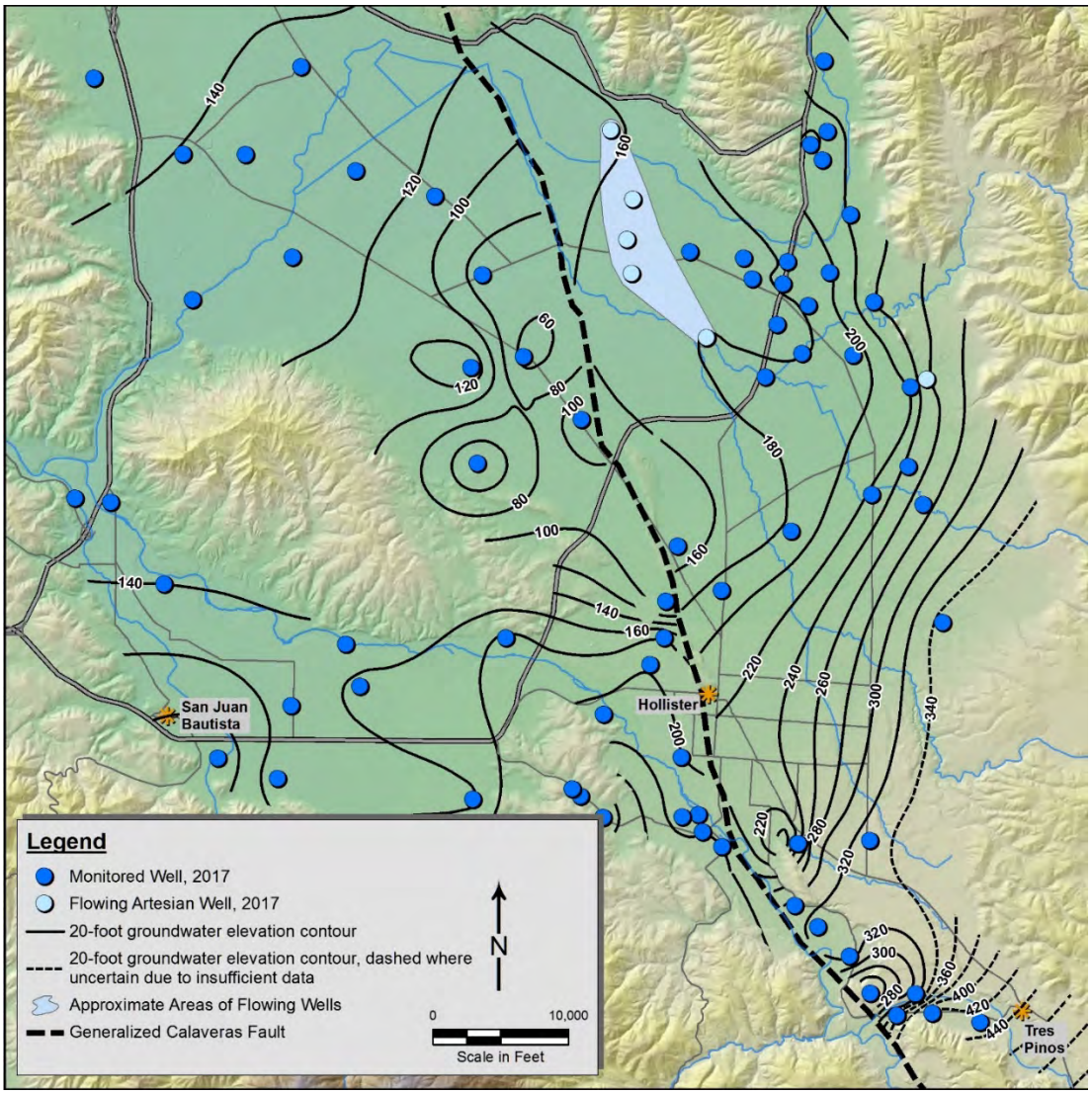
Groundwater Elevations

Groundwater elevation data were examined from 91 wells in the District's quarterly groundwater elevation monitoring program. Generally, October groundwater elevation data are used for preparing groundwater elevation contour maps. However, this year some of the measurements were collected in early November. Groundwater elevations in the fall, including

those shown in **Figure 7**, are assumed to represent the lowest levels for the water year. As in previous years, the groundwater elevation contouring methods incorporate the effects of the Calaveras Fault on groundwater elevations by splitting the area into eastern and western portions and then generating contours for each. The resulting contours are then evaluated for consistency and reasonableness and any necessary refinements are made. The contours indicate a general flow from southeast to northwest in San Benito County and a flow from Llagas Subbasin in Santa Clara County toward the Bolsa.

Profiles of historical groundwater elevations are provided in Figure C-5 in Appendix C. These profiles show groundwater elevations for 2017 and 2016 plus historic groundwater lows and the range of historical groundwater elevations. Review of Figure C-5 indicates a new localized historic low in the Bolsa (Profile B-B'). Previous annual reports (2014, 2015, 2016) also indicated new historic lows. Additional groundwater elevation data are presented in Appendix C, including maps, summary tables, and groundwater elevation data.

Figure 7. Groundwater Elevations, October 2017



The relative changes in groundwater elevations from October 2016 to October 2017 are shown on **Figure 8.** The map was prepared by calculating and contouring the differences between mapped groundwater elevations for the two periods. The accuracy of this map was checked by examining groundwater elevation changes in individual wells that were monitored in the fall quarter of both years. **Figure 9** shows the cumulative drawdown over the recent drought to present (2011 through 2017). The groundwater elevation changes over this period are uneven, and there are some areas where elevations were higher in 2017 than in 2011. However, on average groundwater elevations in all subbasins were still 10 feet lower in the fall of 2017 compared to the fall of 2011.

Figure 8. Change in Groundwater Elevations 2016-2017

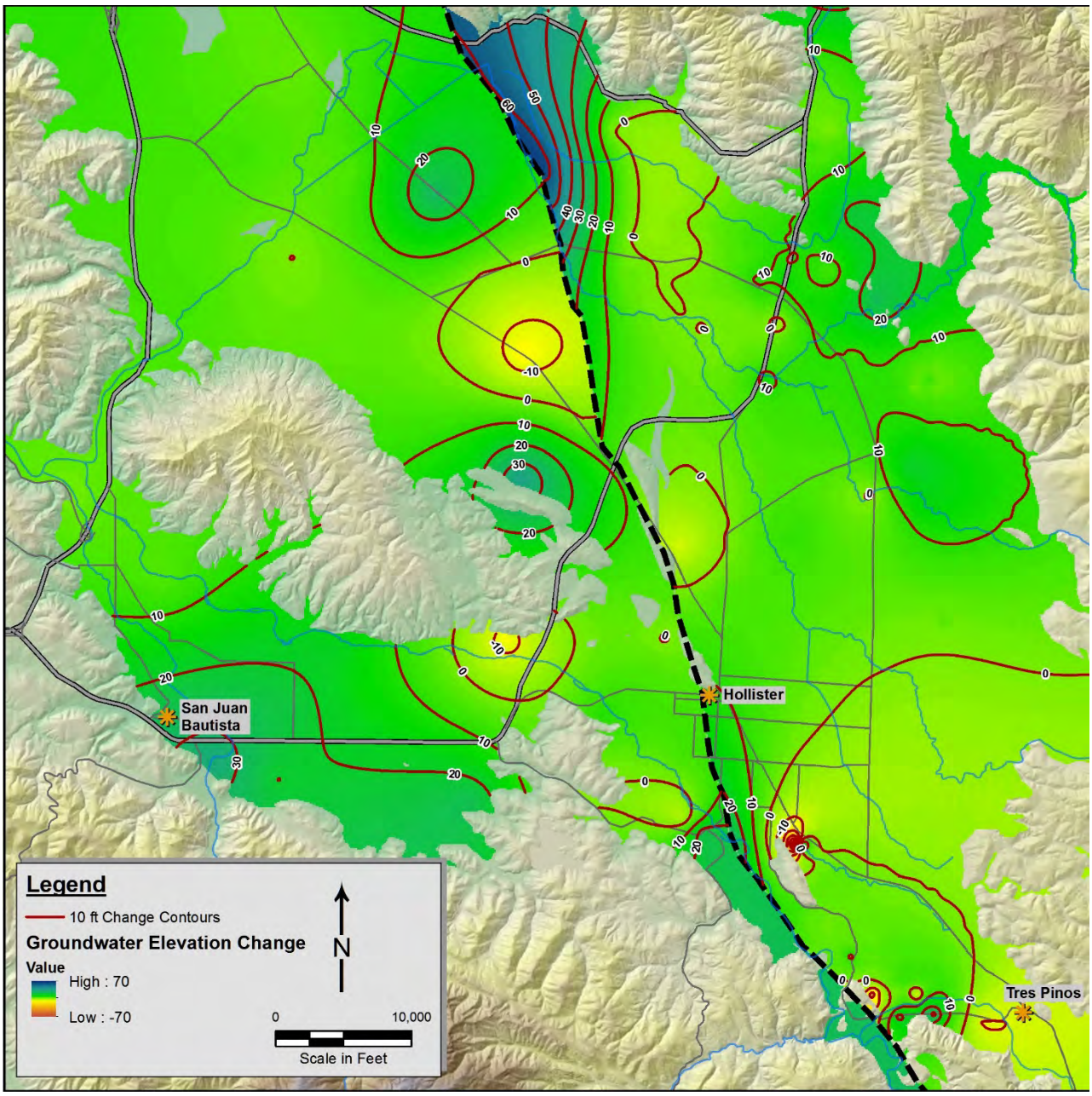
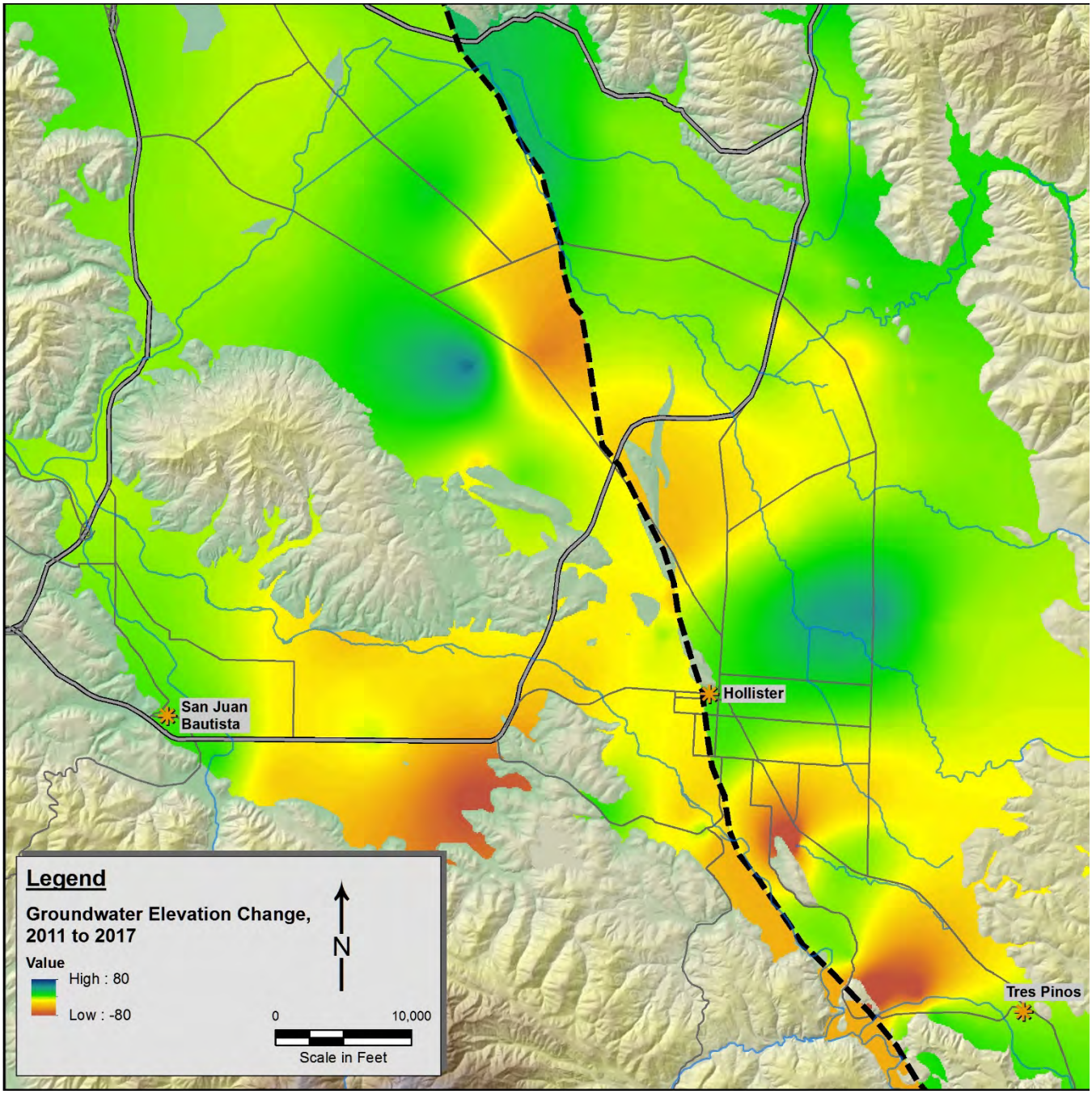


Figure 9. Cumulative Change in Groundwater Elevations 2011-2017



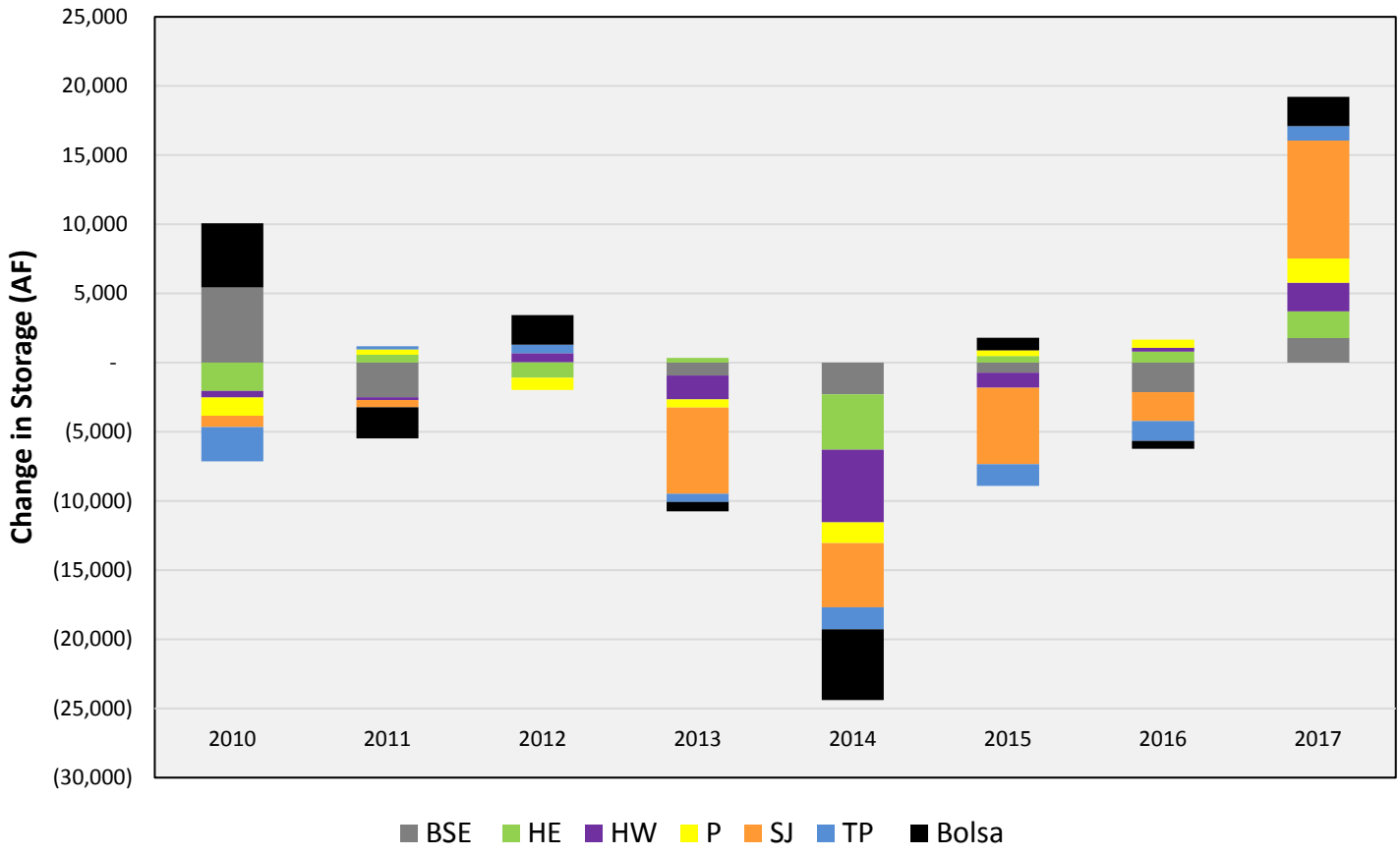
Change in Storage

Groundwater elevation changes from October 2016 to October 2017 were used to determine the change in storage, which is the net volume of water added to or removed from the basin over the water year. The change in storage was calculated using the change in groundwater elevations (feet) and multiplying by the total area (acres) to determine the total bulk volume of change. This bulk volume of change is then multiplied by the average storativity of the subbasin to represent the amount of water that a given volume of aquifer will produce. The storativity values for each subbasin were derived from a numerical model of the basin developed by Yates and Zhang (2001).

The total change in groundwater storage for Zone 6 was an increase of 17,091 AF, while the total change for the basin, including the Bolsa subbasin, was an increase of 19,216 AF. This marks the first year since the beginning of the recent drought when groundwater storage increased in all subbasins. While all subbasins showed increased storage this year, average groundwater elevations in all subbasins continue to be below the elevations when the current drought began in 2011. Average subbasin groundwater elevations compared to 2011 are still more than 27 feet lower in Tres Pinos, more than 20 feet lower in San Juan, 18 feet lower in Bolsa SE, and more than 16 feet lower in Hollister West. **Figure 10** illustrates the change in storage by subbasin for the past eight years.

The change in storage analysis and subsequent calculations are highly dependent on how many and which wells are monitored from year to year. As noted above and in past years, the number of monitored wells has diminished and the set of monitored wells has been unstable. These two factors increase the uncertainty of subbasin-wide storage change estimates because actual groundwater elevation changes cannot be effectively distinguished from apparent fluctuations related to variations in which wells are monitored. In some subbasins and some years, the effects of variations in the monitoring well network have more influence on the average change in groundwater elevations than do measured differences. Stabilization of the year-to-year monitoring well network is necessary for valid assessment of change in storage.

Figure 10. Change in Storage by Subbasin (2010-2017)



Hydrographs

Long term changes in groundwater elevations are illustrated in composite hydrographs. These composite hydrographs are generated by averaging elevations from key wells from each subbasin for each monitoring event. The key well locations are shown on **Figure 11.** It should be noted that these subbasin hydrographs represent average conditions in each subbasin and illustrate long-term trends, but do not show localized variations in groundwater elevations. Overall, groundwater elevations do not indicate overdraft conditions as of 2017.

Groundwater elevations in most subbasins have shown a decrease over the multi-year drought consistent with increased pumping and decreased storage. **Figure 12** shows the composite hydrographs. While precipitation in 2017 was higher than the long-term average, it will be some time before groundwater elevations recover to pre-drought levels. Some factors that will determine the length of recovery include not only precipitation but groundwater use, pattern and intensity of rainfall, local geology (that would affect how much time recharge travels from the surface to the aquifer), and any managed recharge activities (like wastewater percolation).

Figure 11. Locations of Key Wells Used in Hydrographs

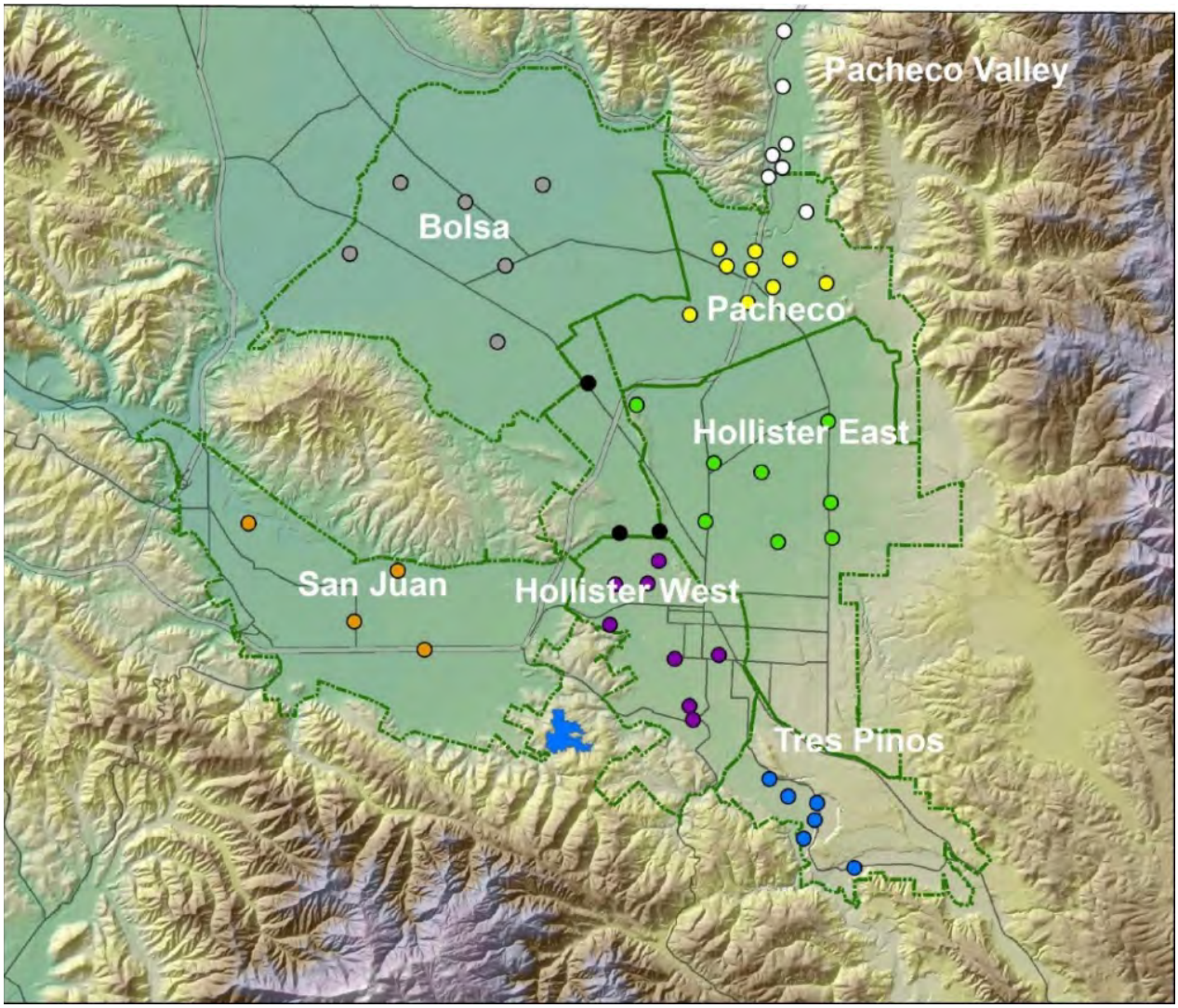
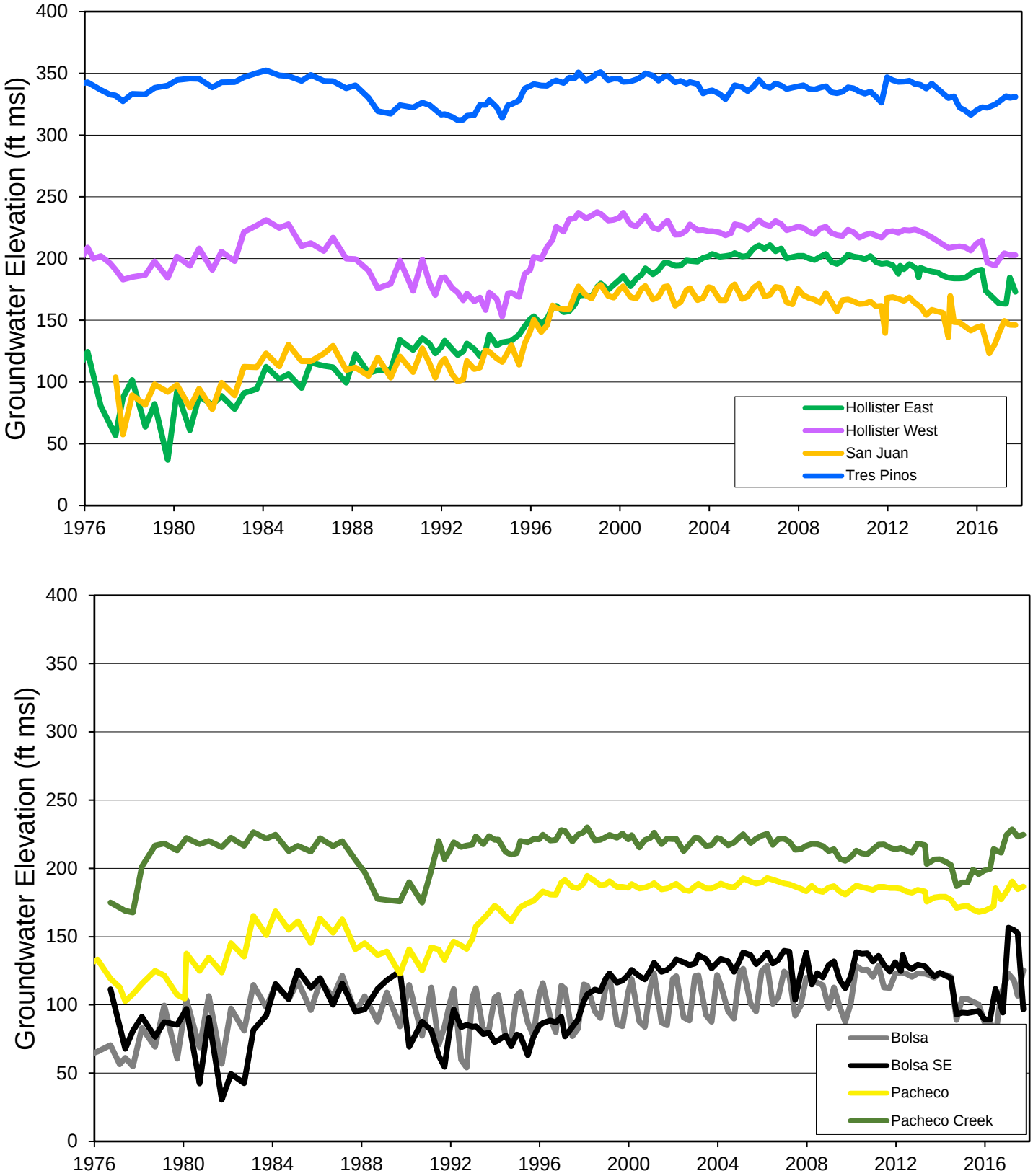


Figure 12. Composite Hydrographs



6 WATER BALANCE

The water balance provides a quantitative assessment of the state of the basin, including estimates of specific inflows and outflows for each individual subbasin, including the subbasins with Zone 6 supply (San Juan, Bolsa SE, Pacheco, Hollister East and West, and Tres Pinos) and the adjacent Bolsa, Paicines, and Tres Pinos Creek Valley subbasins. This detailed understanding of the groundwater system can serve as a basis to evaluate changes in the basin over time and develop tools for groundwater basin management. As in 2014, the soil moisture balance model (based on the 2010 updated land use) was employed to estimate various water balance inflows and confirm outflows. The estimated water balance from 2015 through 2017 is shown in **Tables 5 through 7.** Details on the water balance methodology can be found in Appendix G.

Future water balance analyses, including the water balances required by SGMA, will be conducted according to SGMA regulations and Best Management Practices. Water balances will be assessed according to DWR basin definitions. In addition, an updated hydrogeologic conceptual model and improved numerical model will provide comprehensive simulations of historical, current, and sustainable conditions. Comparison of newly simulated conditions to historical conditions and estimated water balances (in terms of differences between simulated and observed groundwater elevations and flows) will allow identification of data gaps and uncertainties and systematic review and adjustment of water balance analyses.

Inflows

Many inflows to the basin are controlled by hydrologic conditions. Natural stream percolation and deep percolation from rainfall are directly related to the volume and distribution of rainfall. Flow into reservoirs is controlled by stream discharge rates, and releases from reservoirs are a function mostly of stream inflow and available storage. Because they are related to rainfall, these three inflows are generally higher in wet years and lower in dry years. There are five major sources of inflow to the subbasins in Zone 6 and the wider groundwater basin. These include:

- **Natural stream percolation** – Natural stream percolation occurs in every subbasin except Bolsa Southeast (which lacks significant streams) and is most substantial in subbasins with large streams, such as Pacheco, Hollister West and San Juan. Stream percolation varies considerably from year to year depending on rainfall and groundwater elevations. Stream percolation is controlled primarily by the permeable channel area of the waterway and the rate of infiltration. These two variables change over time in response to factors including depth to groundwater, such that shallow groundwater levels and reduced availability of groundwater storage space can limit the volume of inflow.

- **Percolation of reservoir and CVP releases** – Reservoir releases from Hernandez and Paicines Reservoir flow to Zone 3 and Zone 6 via Tres Pinos Creek and the San Benito River. CVP releases occurred in 2017 to off-stream ponds in Hollister West and Pacheco subbasins. The percolation amounts in the Tres Pinos, Hollister West, Pacheco, and San Juan subbasin are estimated separately. Relative to natural percolation, percolation from reservoir releases is less affected by seasonal conditions because it occurs during the dry season after natural streamflow has ceased. However, it ceases entirely in prolonged drought when surface water becomes unavailable.

- **Deep percolation (from rainfall and/or irrigation)** – Deep percolation from the root zone to the water table is estimated separately for rainfall and irrigation. Rainfall percolation varies significantly on an annual basis, while irrigation percolation remains relatively steady. Rainfall deep percolation is dependent on the volume of rainfall, temporal and areal distribution of rainfall, crop type/land cover, and soil type. Percolation from irrigation depends on crop type and irrigation efficiency; it generally does not change significantly from year to year. However, sustained trends in cropping patterns and irrigation techniques could have a noticeable effect over time.

- **Percolation of reclaimed water** – Percolation of reclaimed water in wastewater disposal ponds occurs in three subbasins (San Juan, Hollister West, and Tres Pinos) at facilities operated by the City of Hollister, SSCWD, and Tres Pinos County Water District. Reclaimed water percolation has been relatively low since 2012 (and certainly since the 2003 peak) because of changes in water treatment plant operations and water conservation measures.

- **Subsurface groundwater inflow** –Groundwater can also flow between adjacent subbasins. While significant uncertainty exists in calculating subsurface flow, groundwater elevation gradients were used to estimate the volumes of flow into and between each subbasin. As groundwater flow directions have not changed significantly over the past few years, estimated groundwater inflow and outflow also have not changed significantly.

Outflows

Major outflows from the subbasins in Zone 6 and surrounding area are groundwater pumping (agricultural, M&I, and domestic) and subsurface outflow.

- **Agricultural groundwater pumping** – Agricultural pumping is dependent not only on cropping patterns and irrigation practices, but also on the volume of CVP imports and the amount and timing of rainfall; spring rains decrease total irrigation demand, and growers adjust pumping to compensate for changes in the availability of CVP imports.

- **Municipal pumping** is largely concentrated in the Hollister West, Hollister East, and Tres Pinos subbasins. Pumping by major municipal providers is measured, as is pumping by smaller community water systems in Zone 6. Domestic pumping is not measured.

- **Groundwater subsurface outflow** was calculated along with subsurface inflow. As with subsurface inflow, volumes did not change significantly over time.

- **River and creek outflow** – Discharges from the aquifer to surface water bodies generally occur along the San Benito River in San Juan Subbasin during wet years and along streams in the Hollister and Bolsa subbasins, including Pacheco Creek and Tequisquita Slough. Outflow to streams has not been evaluated systematically on a basin-wide basis. However, such outflow will need to be evaluated in the GSP along with identification of groundwater-dependent ecosystems (GDEs) and establishment of minimum thresholds to avoid undesirable results on GDEs.

Agricultural groundwater pumping is currently measured using hour meters on irrigation wells in Zone 6 and is estimated for surrounding areas based on the soil moisture balance and crop water demands. The duration of pumping at each well is multiplied by the pumping rate of the well to obtain the volume pumped. However, those pumping estimates have consistently been substantially less than estimates based on the soil moisture balance and crop water demands, which is the estimate that has always been used to estimate pumping outside of Zone 6. To be consistent with past annual reports, the agricultural pumping reported is used in the water balance. Future water balances will be prepared consistent with SGMA guidelines, and development of accurate estimates of pumping over the entire DWR defined subbasins may involve a well metering program for all but small wells (with *de minimis* pumping) followed by annual reporting.

Change in Storage

The water balance tables (**Tables 5 through 7**) include two estimates of storage change: the calculated difference between inflows and outflows and the previously-described estimate based on changes in measured groundwater elevations. Both methods rely on assumptions; the inflows and outflows approach is the sum of all individually-estimated water balance components and the groundwater elevation difference approach relies on the quality of groundwater elevation data and on general estimates of storativity. The potential net inaccuracy in these methodologies is illustrated by the difference between the estimates of change in storage that result from each. In 2017, the difference between the water balance inflows and outflows indicated a change in storage that is significantly greater than the change in storage estimated through water level changes. This difference could be indicative of real-world processes, such as a lag between the recharge to the ground surface and the rise in groundwater levels due to migration through the unsaturated zone. Other possible reasons for this discrepancy are more indicative of data gaps. For example, storativity values used to estimate volume from change in water levels may not accurately reflect the average conditions of each subbasin. In addition, the geographic distribution of wells in the water level network may not adequately represent recharge areas.

As a matter of perspective over the past three years, water conditions in the basin have changed significantly in response to drought followed by wet years and data collection has diminished; these changes combine to reduce the reliability of both analytical methods and to increase uncertainty. To improve the water balance and conceptual understanding of the basin, additional data collection and quality control—along with a comprehensive numerical model to test assumptions—would provide tools for increasing the reliability of the change in storage estimates.

Water Balance Conclusions

The water balance trends tend to track the hydrologic trends in the basin. In wet years, there is more recharge and less groundwater pumping and in dry years, the reverse is true. During the past three years, the basin has begun to show recovery from the most recent drought. Inflows increased significantly from 2015 to 2017. In 2015, inflows were reduced to the second lowest volume since 2006 and outflows were high because there was limited imported water for irrigation. By 2017, inflows were the highest since 2006 and outflows decreased as CVP imports resumed.

Tables 5 through 7 show the individual components of the water balance from Water Years 2015, 2016, and 2017. Figure 9 shows the water balance components over time.

The process of preparing the water balance provides important feedback on the availability and accuracy of the data collected and managed by the District. Two important data quality issues, presented in the 2014 report, are repeated here:

1. The soil moisture budget used to calculate return flows for agricultural and natural areas relies on reference evapotranspiration, crop types, crop coefficients, soil type and irrigation efficiency to determine the volume of water that percolates to the aquifer in each subbasin. As an intermediate step, the process also calculates the irrigation water demand of the irrigated lands. The calculated water demand is significantly greater than the reported groundwater use and CVP delivery data. Because the reported groundwater use is based on estimated power use and appears to be far lower than the water demand for the reported crops, the actual groundwater use may be significantly greater than the values reported.

2. The number of wells with available groundwater elevation data has decreased over time due to technical issues. Without a robust, spatially distributed network, the change in storage values may not represent the local or regional state of the subbasins. The storativity distribution is also largely unknown. Variations in storativity could greatly affect the calculated change in groundwater volume.

The SGMA process will provide an opportunity to revise the monitoring networks and improve these critical data sets. The District's GSP preparation will update the hydrogeologic conceptual model (including the water balance), update and improve the numerical model, and develop robust monitoring networks (e.g., for groundwater elevations, water use, and water quality) to aid in long term groundwater management.

Figure 13. Water Balance for Zone 6 and the Bolsa (2006-2017)

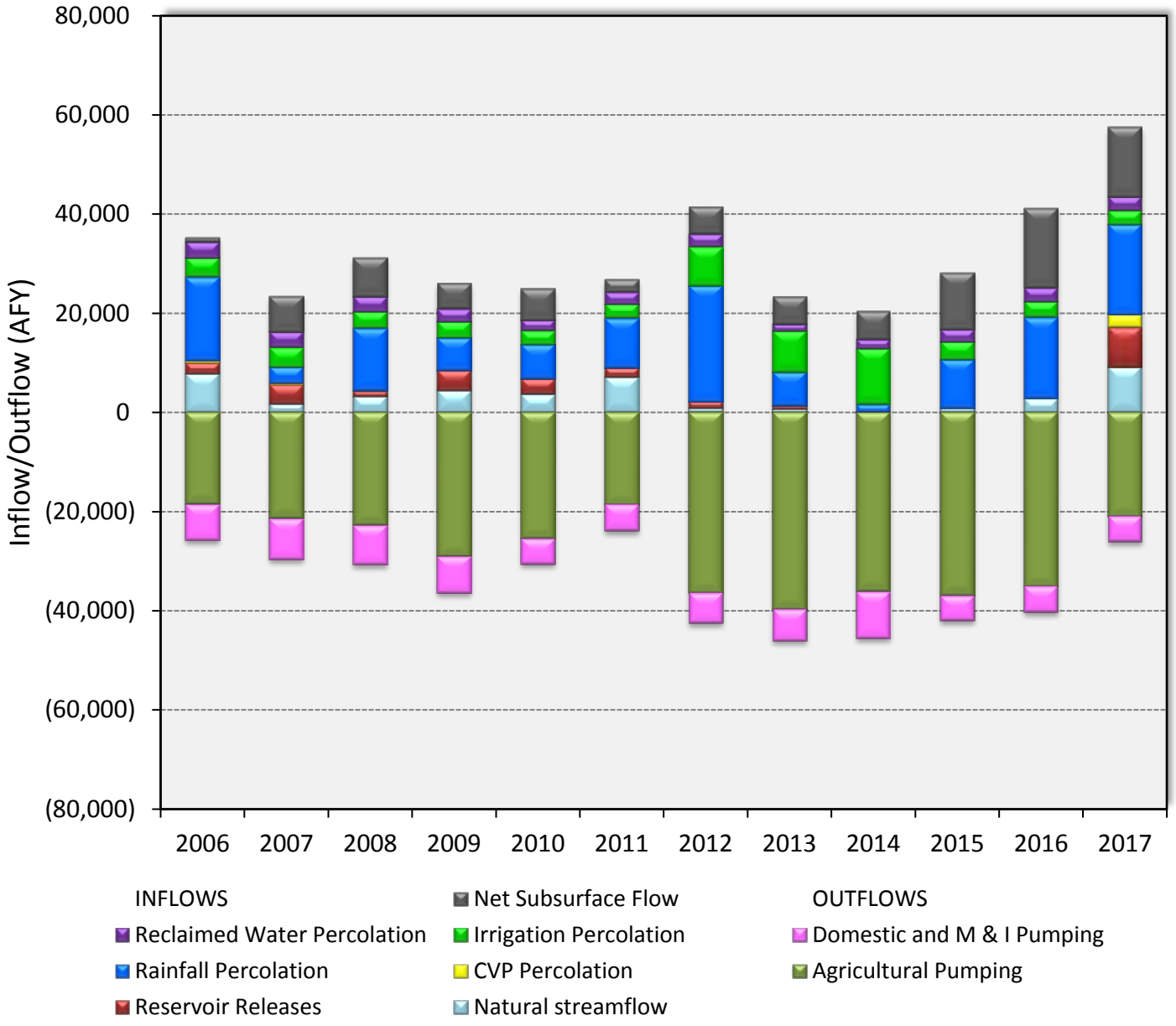


Table 5. Water Balance for Water Year 2015 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow	494	0	52	63	266	21	896	0	0	66	962
Reservoir releases			0	0		0	0	0	0	0	0
CVP Percolation	0	0	0	0	0	0	0	0	0	0	0
Deep percolation through soils											0
Rainfall	1,145	519	3,163	911	1,593	395	7,726	2,033	245	59	10,064
Irrigation	519	205	1,039	367	593	112	2,835	771	118	36	3,760
Reclaimed water percolation	0	0	2,255	44	0	200	2,499	0	0	0	2,499
Groundwater inflow	2,647	5,398	49	4,288	4,101	2,310	18,793	6,866	0	--	17,791
Total	4,805	6,123	6,557	5,672	6,553	3,038	32,749	9,671	363	161	42,943
Outflows											**0**
Wells											0
Agricultural	4,124	2,396	12,280	2,636	6,334	1,459	29,229	7,712	1,176	356	38,472
Domestic and M & I	155	5	459	2,094	896	1,489	5,099	0	0	0	5,099
Groundwater outflow	1,913	3,485	11	5,398	2,080	1,379	14,266	0	500	2,310	17,349
Total	6,193	5,886	12,750	10,128	9,310	4,327	48,594	7,712	1,676	2,310	60,291
Storage change											**0**
Inflows - outflows	(1,387)	237	(6,193)	(4,456)	(2,756)	(1,289)	(15,845)	1,959	(1,313)	(2,149)	(17,348)
Water level change	388	(719)	(5,530)	(1,090)	492	(1,579)	(8,040)	915	(1,455)	(2,574)	(11,155)

Adjustments

Agriculutral pumping is based on reported groundwater use

Adjusted the K used in the Darcy equation to calibration (2015-2017)

Table 6. Water Balance for Water Year 2016 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow	1,346	0	336	147	923	49	2,801	0	1,406	859	5,066
Reservoir releases			0	0		0	0	0	0	0	0
CVP Percolation	0	0	0	0	0	0	0	0	0	0	0
Deep percolation through soils											0
Rainfall	1,627	726	5,496	1,301	2,789	780	12,718	3,750	517	114	17,098
Irrigation	457	166	840	317	525	94	2,400	712	117	35	3,264
Reclaimed water percolation	0	0	2,398	208	0	200	2,806	0	0	0	2,806
Groundwater inflow	2,841	4,142	109	6,908	3,985	2,859	20,843	8,055	0	--	17,791
Total	6,271	5,034	9,178	8,881	8,222	3,981	41,567	12,517	2,039	1,008	57,131
Outflows											**0**
Wells											0
Agricultural	4,220	2,533	13,084	2,036	5,518	522	27,912	7,123	1,165	352	36,552
Domestic and M & I	167	25	497	1,996	865	1,701	5,251	0	0	0	5,251
Groundwater outflow	2,578	1,909	14	4,142	2,338	1,877	12,857	0	500	2,859	17,349
Total	6,964	4,467	13,595	8,173	8,720	4,100	46,019	7,123	1,665	3,211	58,018
Storage change											**0**
Inflows - outflows	(693)	566	(4,417)	708	(498)	(119)	(4,452)	5,394	374	(2,203)	(887)
Water level change	604	(2,139)	(2,086)	282	789	(1,427)	(3,977)	(578)	424	161	(3,970)

Adjustments

Agriculutral pumping is based on reported groundwater use

Rainfall percolation is reduced by 25%, to reflect additional runoff during intense storms

Adjusted the K used in the Darcy equation to calibration (2015-2017)

Table 7. Water Balance for Water Year 2017 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow	3,537	0	1,464	1,410	1,844	952	9,207	0	657	2,398	12,261
Reservoir releases			1,955	2,158	0	3,863	7,976	0	847	0	8,823
CVP Percolation	340	0	0	2,209	0	0	2,549	0	0	0	2,549
Deep percolation through soils											
Rainfall	1,888	689	5,399	1,474	3,199	943	13,592	4,546	1,943	492	20,573
Irrigation	438	156	811	310	477	96	2,288	624	102	33	3,048
Reclaimed water percolation	0	0	2,310	228	0	208	2,746	0	0	0	2,746
Groundwater inflow	3,081	4,317	74	6,775	3,663	2,610	20,520	5,916	0	0	17,791
Total	9,284	5,162	12,013	14,562	9,183	8,672	58,877	11,087	3,549	2,923	76,435
Outflows											
Wells											0
Agricultural	2,904	1,399	6,914	971	2,192	347	14,727	6,245	1,025	328	22,324
Domestic and M & I	52	3	980	1,554	658	1,840	5,088	0	0	0	5,088
Groundwater outflow	1,667	1,465	16	4,317	2,595	2,332	12,392	0	500	2,610	17,349
Total	4,623	2,867	7,910	6,842	5,445	4,519	32,207	6,245	1,525	2,937	42,914
Storage change											
Inflows - outflows	4,661	2,295	4,103	7,720	3,738	4,153	26,670	4,842	2,024	(14)	33,522
Water level change	1,736	1,767	8,531	2,084	1,939	1,034	17,091	2,125	976	2,060	22,253

Adjustments

Agricultural pumping is based on reported groundwater use for Zone 6, land use for outside Zone 6

Rainfall percolation is reduced by 66%, to reflect additional runoff during intense storms

Adjusted the K used in the Darcy equation to calibration (2015-2017)

Sreams in Bolsa were assumed to percolate rain water; this is included under deep percolation

Streamflows exceeding 30 cfs in San Benito River was assumed to flow out of the basin and flows exceeding 10 cfs in smaller creeks were assumed to flow out of the basin

7 FINANCIAL INFORMATION

The District derives its operating revenue from charges levied on landowners and water users. Non-operating revenue is generated from property taxes, interest, standby and availability charges, and grants. Zone 6 charges, relating to the importation and distribution of CVP water, are the focus of this section.

The groundwater charge for Zone 6 water users reflects costs associated with groundwater monitoring and management, including the cost of purchasing CVP water and power charges associated with percolation. The per-acre-foot charge is determined by dividing these costs by the volume of groundwater usage. Groundwater charges are adjusted annually in March. For March 2017-February 2018, the District rates are $6.45 for agricultural use and a groundwater charge of $24.25 for M&I use.

The District has also calculated the groundwater charge for the next USBR water year (March 2018-February 2019). The detailed calculation is shown in Appendix F; the District recommends that rates increase to $7.95 for agricultural use in Zone 6. A groundwater charge of $24.25 is recommended for M&I use in Zone 6.

CVP rates (provided by the USBR) include the cost of service, restoration fund payment, charges for maintenance of San Luis Delta Mendota Water Authority facilities, and other fees (the breakdown is found in Appendix F). The District's San Felipe rates (paid by users) include a standby and availability charge, power charge, and a water charge. The standby and availability charge is a $6 per-acre charge assessed on all parcels with access to CVP water (an active or idle turnout from the distribution system). Power charges depend on the location of user. **Table 8a and b,** on the following page, shows the District San Felipe water and power charges, respectively, for the Water Years 2017-2018 and 2018-2019.

Table 8a. District San Felipe Water Charges 2017-2018 and 2018-2019

Blue Valve Water Charge ($/af)				
Year	Agricultural			Municipal & Industrial
	Non - Full Cost	Full Cost (1a)	Full Cost (1b)	
2017-2018	$191.00	$364.00	$382.00	$363.00
2018-2019	$272.00	$445.00	$463.00	$363.00

Table 8b. District San Felipe Power Charges 2017-2018 and 2018-2019

Blue Valve Power Charge ($/acre-foot)	2017-2018	2018-2019
Subsystem 2	$126.80	$130.60
Subsystem 6H	$77.90	$80.25
Subsystem 9L	$113.25	$116.65
Subsystem 9H	$167.45	$172.45
All other subsystems	$68.05	$70.10

Notes:

1 "Full-cost rates for agricultural users apply to landholders that have exceeded his/her or its non full-cost entitlement. There are two full-cost rates:

a. Section 202(3) - the lower full-cost rate, which applies to qualified recipients leasing in excess of their 960-acre entitlement, limited recipients that received Reclamation irrigation water on or before October 1, 1981, and extended recordable contracts.

There are currently no Zone 6 full-cost users under this section.

b. Section 205(a)(3) - the higher full-cost rate, which applies to prior law recipients leasing in excess of their applicable no full-cost entitlement, and limited recipients that did not receive Reclamation irrigation water on or before October 1, 1981.

See Section 202(3) or 205(a)(3) of RRA Rules and Regulations for further non-full-cost definitions.

Recycled Water rates (**Table 9)** were set through 2017 to recover current operating and maintenance costs related to the water service. Recycled water rates include those costs associated with water supply, water quality, and infrastructure (SBCWD February 2015).

Table 9. Recycled Water Charges, 2016-2017

Recycled Water		
Effective	**Agriculture Rate**	**Power Charge**
3/1/2016	$182.55	$57.70
3/1/2017	$183.45	$59.45

Rates for water year 2018-2019 have not yet been adopted.

Development of a GSP by the District will be followed by expanded monitoring and management, with annual reporting and GSP updates every five years, consistent with SGMA. This will entail increased costs for operation and maintenance; during the GSP development process, the District will explore financial measures to support SGMA compliance equably across the managed subbasins.

8 OUTLOOK

La Niña

The next water year, 2017-2018, is expected to be a weak La Niña year. The National Weather Service (NWS) is predicting that precipitation will be normal or slightly below normal for Northern California for most of the winter and spring (NWS 2017). We note that even average precipitation will aid in the replenishment of the groundwater basins and perhaps translate to higher CVP allocations.

CVP Deliveries

The annual allocation of CVP water remains uncertain. In past years, San Luis & Delta Mendota Water Authority (SLDMWA) has forecasted CVP allocation for the next year. SLDWMA no longer publishes estimated allocation in the fall. Many factors affect the allocation, including environmental considerations in the Delta, seniority of CVP water rights on water ways, reduced snowpack due to climate change, debt to the State Water Project System and other factors. The District must continue to use its existing tools (and continue to develop new management tools) to secure a reliable water supply despite variable CVP allocations.

Groundwater

In 2017, groundwater storage increased throughout most of the basin as a result of the very wet winter. However, groundwater elevations have not recovered yet to pre-drought levels. Multiple years of normal to above-normal rainfall and restored CVP supply will be needed to replenish groundwater storage.

Current groundwater storage is sufficient to accommodate water demand in the short term even with negative water budgets, and the capacity for groundwater recovery in subsequent wet years is sufficient to balance moderate increases in groundwater pumping without causing long-term overdraft. However, resumption of drought and reduced CVP supply entail a real risk of overdraft.

9 RECOMMENDATIONS

The water supply outlook is mixed. While precipitation is expected to be average—with promise of some replenishment--the state's and the basin's water resources have been depleted by years of drought that will require additional years to recover. The District should continue to move forward with plans and projects to ensure a more sustainable water supply system that includes a portfolio of sources.

Groundwater Sustainability. The District plans to begin GSP preparation early in 2018. As summarized in the SGMA section of this report, this preparation should progress systematically throughout the various tasks of: compilation and review of data, development of a hydrogeologic conceptual model and water budgets, update and extension of the groundwater model, evaluation of sustainability criteria, identification of management actions and development of monitoring networks and protocols. The entire process will occur with agency collaboration and stakeholder involvement to improve groundwater management. The District should proceed with its request to DWR for basin consolidation.

Groundwater Charges. Based on the methodology used since 2006, the groundwater charge for the USBR contract year (March 2017-February 2018) is recommended to be $6.45 for agricultural use in Zone 6 and a groundwater charge of $24.25 is recommended for M&I use in Zone 6.

G**roundwater Production and Replenishment.** District percolation operations helped to reverse historical overdraft and then accumulate a water supply reserve. The District currently manages groundwater storage and surface water to minimize excessively high or low groundwater elevations on a temporal and geographic basis. In 2017, storage in Hernandez Reservoir was effectively replenished and substantial releases were made to aid the recovery of groundwater levels in portions of the basin with persistent low groundwater elevations, like Tres Pinos, Hollister West, and San Juan. Such replenishment activities should be continued into 2018, with use of the District's new operations planning tool. In addition, in 2017 the District provided off-channel percolation of CVP water; this too should be continued given availability of CVP water and persistence of low groundwater levels. Given the decreased reliability of imported supplies and continuing threat of drought, such timely and intensive replenishment operations are critical to sustainable groundwater supply.

Groundwater Monitoring. The number of wells in both the groundwater elevation network and water quality network has declined over time. The District plans to improve the monitoring network and redouble efforts to monitor a stable network of wells on a regular basis. In addition, it will expand monitoring to cover the entire GSA area. If for some reason wells are no longer part of the network, they should be replaced as soon as possible with a nearby, comparably-constructed well that can serve as a permanent addition to the network.

10 REFERENCES

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A REPORTING REQUIREMENTS AND SPECIAL TOPICS

List of Tables

Table A-1. Special Topics in Previous Annual Reports

The San Benito County Water District Act (1953) is codified in California Water Code Appendix 70. Section 70-7.6 authorizes the District Board of Directors to require the District to prepare an annual groundwater report; this report addresses groundwater conditions of the District and its zones of benefit for the water year, which begins October 1 of the preceding calendar year and ends September 30 of the current calendar year. The Board has consistently ordered preparation of Annual Reports, and the reports have included the contents specified Section 70-7.6:

- An estimate of the annual overdraft for the current water year and for the ensuing water year
- Information for the consideration of the Board in its determination of the annual overdraft and accumulated overdraft as of September 30 of the current year
- A report as to the total production of water from the groundwater supplies of the District and its zones as of September 30 of the current year
- Information for the consideration of the Board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the District and its zones
- The amount of water the District is obligated to purchase during the ensuing water year
- A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the District and its zones during the ensuing water year
- A recommendation as to whether or not a groundwater charge should be levied in any zone(s) of the District in the ensuing water year and if so, a rate per acre-foot for all water other than agricultural water for such zone(s)
- Any other information the Board requires.
- The full text of Appendix 70, Section 70-7.6 through 7.8 is enclosed at the end of this appendix.
- Each water year a special topic is identified for further consideration. These topics have included water quality, salt loading, shallow wells, and others. Additional analyses and documentation provided in previous annual reports are summarized in the following table.

Table A-1. Special Topics in Previous Annual Reports

Water Year	Additional Analyses and Reporting
2000	Methodology to calculate water supply benefits of Zone 3 and 6 operations
2001	Preliminary salt balance
2002	Investigation of individual salt loading sources
2003	Documentation of nitrate in supply wells, drains, monitor wells, San Juan Creek
2004	Documentation of depth to groundwater in shallow wells
2005	Tabulation of waste discharger permit conditions and recent water quality monitoring results
2006	Rate study
2007	Water quality update
2008	Water budget update
2009	Water demand and supply
2010	Water quality update
2011	Water budget update
2012	Land use update
2013	Water quality update
2014	Water balance update and Groundwater Sustainability
2015	Groundwater Sustainability – Basin Boundaries and GSAs
2016	Water quality update
2017	Water budget update

Water Code Appendix 70 Excerpts

Section 70-7.6. Groundwater; investigation and report: recommendations San Benito County

Sec. 7.6. the board by resolution require the district to annually prepare an investigation and report on groundwater conditions of the district and the zones thereof, for the period from October 1 of the preceding calendar year through September 30 of the current year and on activities of the district for protection and augmentation of the water supplies of the district and the zones thereof. The investigation and report shall include all of the following information:

(a) Information for the consideration of the board in its determination of the annual overdraft.

(b) Information for the consideration of the board in its determination of the accumulated overdraft as of September 30 of the current calendar year.

(c) A report as to the total production of water from the groundwater supplies of the district and the zones thereof as of September 30 of the current calendar year.

(d) An estimate of the annual overdraft for the current water year and for the ensuing water year.

(e) Information for the consideration of the board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the district and the zones thereof for the ensuing water year.

(f) The amount of water the district is obligated to purchase during the ensuing water year.

(g) A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the district and the zones thereof the ensuing water year.

(h) A recommendation as to whether or not a groundwater charge should be levied in any zone or zones of the district during the ensuing year.

(i) If any groundwater charge is recommended, a proposal of a rate per acre-foot for agricultural water and a rate per acre-foot for all water other than agricultural water for such zone or zones.

(j) Any other information the board requires.

(Added by Stats. 1965, c. 1798,p.4167, 7. Amended by Stats.1967,c.934, 5, eff. July27,1967; Stats. 1983, c. 402, 1; Stats. 1998, c. 219 (A.B.2135), 1.)

Section 70-7.7. Receipt of report; notice of hearing; contents; hearing

Sec. 7.7. (a) On the third Monday in December of each year, the groundwater report shall be delivered to the clerk of the board in writing. The clerk shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of a public hearing to be held on the second Monday of January of the following year in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding the groundwater report shall be held. The notice shall include, but is not limited to, an invitation to all operators of water producing facilities within the district to call at the offices of the district to examine the groundwater report.

(b) The board shall hold, on the second Monday of January of each year, a public hearing, at which time any operator of a water-producing facility within the district, or any person interested in the condition of the groundwater supplies or the surface water supplies of the district, may in person, or by representative, appear and submit evidence concerning the groundwater conditions and the surface water supplies of the district. Appearances also may be made supporting or protesting the written groundwater report, including, but not limited to, the engineer's recommended groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4167, 8. Amended by Stats. 1983, c. 02,2; Stats. 1998, c. 219 (A.B.2135,2.)

Section 70-7.8. Determination of groundwater charge; establishment of rates; zones; maximum charge; clerical errors

Sec. 7.8. (a) Prior to the end of the water year in which a hearing is held pursuant to subdivision (b) of Section 7.7, the board shall hold a public hearing, noticed pursuant to Section 6061 of the government Code, to determine if a groundwater charge should be levied, it shall levy, assess, and affix such a charge or charges against all persons operating groundwater- producing facilities within the zone or zones during the ensuing water year. The charge shall be computed at fixed and uniform rate per acre-foot for agricultural water, and at a fixed and uniform rate per acre-foot for all water other than agricultural water. Different rates may be established in different zones. However, in each zone, the rate for agricultural water shall be fixed and uniform and the rate for water other than agricultural water shall be fixed and uniform. The rate for agricultural water shall not exceed one-third of the rate for all water other than agricultural water.

(b) The groundwater charge in any year shall not exceed the costs reasonably borne by the district in the period of the charge in providing the water supply service authorized by this act in the district or a zone or zones thereof.

(c) Any groundwater charge levied pursuant to this section shall be in addition to any general tax or assessment levied within the district or any zone or zones thereof.

(d) Clerical errors occurring or appearing in the name of any person or in the description of the water-producing facility where the production of water there from is otherwise properly charged, or in the making or extension of any charge upon the records which do not affect the substantial rights of the assesse or assesses, shall not invalidate the groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4168, 9. Amended by Stats. 1983, c. 402, 3; Stats.1983, c. 402, 3; Stats. 1998, c. 219 (A.B.2135), 3.)

B CLIMATE DATA

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Table B-1. Monthly Precipitation at the SBCWD CIMIS Station (inches)

Table B-2. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Figure B-1. Monthly Precipitation in Hollister in 2017

Table B-1. Monthly Precipitation at the SBCWD CIMIS Station (inches)

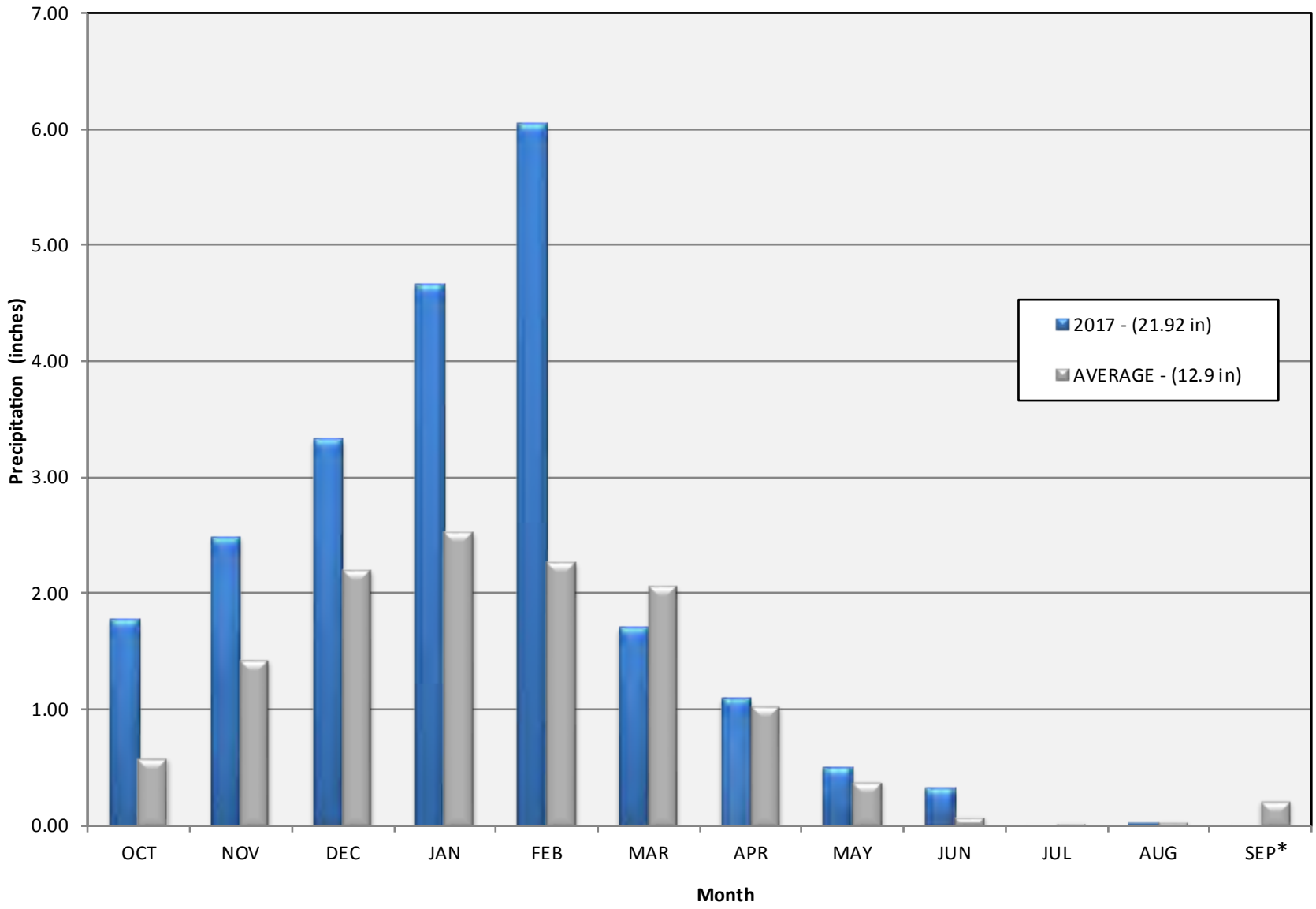
Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	0.1	0	2.2	4.4	4.5	1.6	1.3	1.3	0	0	0	0	**15.5**	**120%**
1997	1.0	3.2	4.3	6.8	0.2	0.1	0.2	0	0.1	0	0	0	**15.9**	**123%**
1998	0.2	3.8	2.6	4.9	9.1	2.7	2.3	2.4	0.1	0	0	0.1	**28.1**	**218%**
1999	0.5	1.9	0.8	2.5	2.5	1.5	0.7	0.1	0.1	0	0	0	**10.6**	**82%**
2000	0.1	1.0	0.1	4.1	4.5	0.7	0.4	0.5	0.1	0	0	0	**11.5**	**89%**
2001	3.5	0.8	0.2	2.9	2.8	0.6	2.2	0	0	0	0	0	**13.1**	**101%**
2002	0.7	11.5	11.9	0.7	1.2	1.6	0.4	0.3	0	0	0	0	**28.1**	**218%**
2003	0.0	1.7	5.0	0.8	1.4	1.1	3.1	0.1	0	0	0.1	0	**13.1**	**102%**
2004	0.2	0.6	5.3	1.3	4.2	0.6	0.3	0.1	0	0	0	0	**12.5**	**97%**
2005	2.0	0.5	3.5	2.5	2.9	3.4	0.8	0.6	0.4	0	0	0	**16.7**	**129%**
2006	0.1	0.3	3.1	1.5	1.0	5.0	1.7	0.4	0	0	0	0	**13.0**	**101%**
2007	0.2	0.7	1.7	0.6	2.2	0.3	0.6	0	0	0	0	0.4	**6.7**	**52%**
2008	0.7	0.7	0.9	4.6	2.1	0.1	0.1	0	0	0	0	0	**9.1**	**70%**
2009	0.3	1.1	1.9	0.4	3.7	1.8	0.2	0.5	0	0	0	0.2	**10.0**	**77%**
2010	0.5	0	1.3	2.3	2.2	1.7	3.4	0.6	0	0	0	0	**12.1**	**94%**
2011	0.7	1.9	2.6	1.6	2.6	2.3	0.2	0.8	0	0	0	0	**13.0**	**100%**
2012	0.7	1.0	0.1	0.8	0.5	2.3	1.4	0.3	0	0	0	0	**7.1**	**55%**
2013	0.0	2.2	1.2	1.4	0.6	0.5	0.3	0.0	0	0	0	0	**6.3**	**49%**
2014	0.1	0.4	0.2	0.2	1.9	1.6	0.9	0.0	0	0	0	0	**5.4**	**41%**
2015	1.6	0.5	5.8	0.0	1.2	0.2	0.2	0.9	0.0	0.0	0.1	0.1	**10.6**	**82%**
2016	0.2	3.7	1.6	4.0	0.6	3.7	0.8	0.1	0.1	0.1	0.1	0.1	**14.9**	**115%**
2017	1.8	2.5	3.3	4.7	6.1	1.7	1.1	0.5	0.3	0.0	0.0	0.0	**21.9**	**170%**
AVG	**0.6**	**1.5**	**2.2**	**2.6**	**2.3**	**2.1**	**1.0**	**0.4**	**0.1**	**0.0**	**0.0**	**0.2**	**12.9**	**104%**

Note: The averages are for the available period of record, starting in 1875 for precipitation and 1995 for reference evapotranspiration.
The CIMIS value for September 2017 (2.4") includes measurement error due to irrigation overspray. The corrected District value is 0".

Table B-2. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	3.9	2.2	1.2	1.5	1.9	3.7	5.1	6.1	6.7	7.4	6.7	4.7	**51.0**	**104%**
1997	3.8	1.8	1.4	1.4	2.5	4.3	5.8	7.5	7.1	7.2	6.7	5.7	**55.2**	**113%**
1998	3.9	1.8	1.5	1.3	1.4	2.8	4.3	4.5	5.3	6.9	6.8	4.7	**45.2**	**92%**
1999	3.5	1.7	1.5	1.5	1.8	3.0	4.7	5.8	6.7	6.9	5.9	4.7	**47.8**	**98%**
2000	4.0	2.0	1.9	1.2	1.6	3.7	5.1	6.0	6.7	6.7	6.2	4.7	**50.0**	**102%**
2001	2.9	1.7	1.5	1.5	1.8	3.1	3.9	6.2	6.5	6.0	6.2	4.8	**46.0**	**94%**
2002	3.5	1.9	1.2	1.5	2.3	3.7	4.2	6.4	7.1	7.2	6.1	5.4	**50.5**	**103%**
2003	3.6	1.9	1.3	1.6	1.8	3.9	3.8	6.0	6.5	7.3	6.2	5.1	**48.8**	**100%**
2004	4.1	1.7	1.2	1.3	1.7	4.0	5.2	6.4	6.7	6.6	6.0	5.3	**50.3**	**103%**
2005	3.1	1.7	1.4	1.3	1.7	3.0	4.4	5.7	6.4	6.9	6.1	4.6	**46.2**	**94%**
2006	3.6	2.0	1.2	1.4	2.2	2.4	3.0	5.5	6.4	7.0	5.6	4.4	**44.7**	**91%**
2007	3.3	1.7	1.4	1.8	1.8	4.1	4.8	6.3	6.9	6.8	6.5	4.7	**49.8**	**102%**
2008	3.5	2.2	1.4	1.3	2.0	3.8	5.2	6.0	6.9	6.7	6.3	5.0	**50.2**	**103%**
2009	3.8	1.9	1.4	1.7	1.7	3.5	4.8	5.5	6.3	7.1	6.3	5.3	**49.3**	**101%**
2010	3.5	2.2	1.7	1.3	1.8	3.5	3.9	5.4	6.7	6.3	5.9	5.0	**47.0**	**96%**
2011	3.0	1.9	1.1	1.6	2.1	2.7	4.4	5.3	6.0	6.6	5.7	4.6	**45.0**	**92%**
2012	3.3	1.9	1.8	1.8	2.5	3.3	4.4	6.4	6.8	6.6	6.0	4.6	**49.5**	**101%**
2013	3.3	1.8	1.2	1.5	2.1	3.7	5.4	6.3	6.4	6.5	6.0	4.8	**48.8**	**100%**
2014	3.5	2.0	1.8	2.1	1.9	3.6	4.9	6.8	6.6	6.4	6.0	4.7	**50.4**	**103%**
2015	3.9	1.9	1.5	1.8	2.2	4.1	5.1	5.0	6.4	6.5	6.5	5.3	**50.2**	**102%**
2016	4.1	2.1	1.4	1.3	2.7	3.4	4.7	5.7	7.5	7.2	5.7	5.2	**51.0**	**104%**
2017	3.4	2.1	1.5	1.6	1.8	3.7	4.5	6.3	6.8	7.6	6.0	5.2	**50.4**	**103%**
AVG	3.6	1.9	1.4	1.5	2.0	3.5	4.6	6.0	6.6	6.8	6.2	4.9	**49.0**	**100%**

Note: The averages are for the available period of record, starting in 1875 for precipitation and 1995 for reference evapotranspiration.



* CIMIS data adjusted for know irrigation near raingage
CIMIS data for September 2017 reflects irrigation occuring at site, not precipitation

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Figure B-1
Monthly Precipitation
Hollister (2017)

C HYDROLOGICAL DATA

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Table C-1. Groundwater Elevations October 2016 through October 2017

Well Number	Well Depth	Depth to Top	Ground	Subbasin	Key Well	Groundwater Elevations (feet MSL)				
						Oct-16	Jan-17	Apr-17	Jul-17	Oct-17
Bolsa SE										
12-5-09M1	240.00	105.00		BSE	*	115.3		125.8	117.4	115.6
12-5-21Q1	500.00	0.00		BSE	*			260.0	260.0	
12-5-22N1	372.00	250.00		BSE	*	73.3		78.8	80.7	77.7
Hollister East										
12-5-14N1	0.00	0.00		HE	*				229.0	
12-5-22C1	237.00	102.00		HE	*	155.0	163.7	121.9	133.7	146.3
12-5-22J2	355.00	120.00		HE	*	185.5		191.3	190.9	190.1
12-5-23A20	862.00	178.00		HE	*	173.0		177.0	184.7	182.6
12-6-07P1	147.00	0.00		HE		224.1		246.6	244.5	243.9
12-6-18G1	198.00	70.00		HE		257.4	263.7	276.7	275.4	273.6
12-6-30E1	0.00	0.00		HE		347.4	348.8	349.2	347.7	348.9
13-6-07D2	0.00	0.00		HE		335.2	337.6	335.3	335.9	332.9
2317	0.00	0.00		HE		222.7	227.3	223.8	222.7	221.5
ROSSI 1	0.00	0.00		HE		223.2	227.3	235.3	224.0	222.4
Hollister West										
12-5-27E1	175.00	0.00		HW	*	182.3		188.2	183.1	181.7
12-5-28J1	220.00	0.00		HW	*	194.0	195.9	199.6	197.4	198.6
12-5-33E2	121.00	81.00		HW	*	195.3	196.0	202.6	202.9	205.4
12-5-34P1	195.00	153.00		HW	*	193.4	198.3	202.8	201.6	199.3
13-5-03L1	126.00	0.00		HW	*	206.5	208.4	213.2	212.8	211.7
13-5-04B	0.00	0.00		HW		212.8	213.4	213.4	211.5	207.4
13-5-10B1	0.00	0.00		HW	*	195.1	195.5	219.5	218.9	219.6
13-5-10L1	252.00	52.00		HW		312.0	312.0	312.0	312.0	
13-5-11E1	0.00	0.00		HW		239.0	237.0	246.6	274.3	277.9
San Justo 4 (INDART)	0.00	0.00		HW		271.6	271.7	275.1	273.5	272.7
San Justo 6 (ROSE)	0.00	0.00		HW		234.6	235.1	235.6	233.5	231.9
Pacheco										
11-5-26N2	232.00	95.00		P	*	165.4		174.4	170.9	173.6
11-5-26R3	225.00	65.00		P	*	169.6	179.6	185.3	181.1	180.4
11-5-35C1	180.00	0.00		P	*	169.8	172.7	179.8	177.8	176.7
11-5-35G1	230.00	0.00		P	*	172.0	178.3	186.0	184.1	185.1
11-5-35Q3	0.00	0.00		P	*	160.6	164.2	176.0	161.5	159.7
11-5-36C1	98.00	0.00		P	*	187.8	190.4	194.4	176.5	194.3
11-5-36M1	0.00	0.00		P	*	172.7	175.2	189.2	186.4	185.7
11-6-31M2	188.00	155.00		P	*	215.6	221.9	245.5	243.3	241.8
12-5-01G2	300.00	0.00		P		176.6	178.2	182.8	187.9	186.7
12-5-02H5	128.00	42.00		P		169.8		185.0	181.6	178.8
12-5-02L2	170.00	0.00		P		185.6	189.1	198.5	195.6	194.6
12-5-03B1	128.00	100.00		P	*	182.0	182.0	182.0	182.0	182.0
12-6-06K1	260.00	16.00		P		260.0	260.0	260.0	260.0	260.0
12-6-06L4	235.00	50.00		P		213.5	215.3	221.1	220.8	221.6
San Juan										
12-4-17L20	0.00	0.00		SJ		117.8	122.6	124.6	122.8	121.9
12-4-18J1	0.00	0.00		SJ		120.3	122.2	126.6	121.6	121.6
12-4-21M1	250.00	0.00		SJ	*	134.7	139.6	145.3	140.8	139.7
12-4-26G1	876.00	240.00		SJ	*	128.6	138.5	150.8	146.7	145.9
12-4-34H1	387.00	120.00		SJ	*	130.1	138.8	152.4	151.7	152.7
12-4-35A1	325.00	110.00		SJ		150.6	159.4	173.3	167.3	165.5
12-5-30H1	240.00	0.00		SJ		199.2	198.6	199.4	183.5	185.7
13-4-03H1	312.00	168.00		SJ		126.5	137.1	151.2	145.7	146.4
13-4-4A3	0.00	0.00		SJ		163.2	165.6	200.2	198.9	197.9
RIDER BERRY	0.00	0.00		SJ		130.1	142.3	160.4	157.8	155.9

Table C-1. Groundwater Elevations October 2016 through October 2017

Well Number	Well Depth	Depth to Top	Ground	Subbasin	Key Well	Groundwater Elevations (feet MSL)				
						Oct-16	Jan-17	Apr-17	Jul-17	Oct-17
Tres Pinos										
13-5-12D4	0.00	0.00		TP		197.0	236.0	122.0	171.0	169.0
13-5-12K1	0.00	0.00		TP		313.0	314.0	317.0	317.0	
13-5-12N20	352.00	301.00		TP	*	303.0	304.5	309.3	308.4	310.1
13-5-13F1	134.00	30.00		TP	*	324.2	324.9	326.8	324.5	325.7
13-5-13J2	180.00	0.00		TP	*	327.2	328.1	336.7	333.6	330.6
13-6-19J1	340.00	128.00		TP		413.3	414.5	430.8	427.3	428.6
13-6-19K1	211.00	0.00		TP	*	344.8	349.6	353.5	354.5	357.6
13-6-20K1	0.00	0.00		TP			408.1	428.3	427.6	427.5
Bolsa										
11-4-25H1	0.00	0.00		B		86.3		119.3	115.7	114.4
11-4-26B1	642.00	149.00		B	*	126.8		135.4	132.9	131.9
11-4-34A1	100.00	0.00		B	*	128.1		137.0	128.9	127.9
11-5-20N1	300.00	0.00		B	*	72.3		97.7	63.3	
11-5-21E2	220.00	100.00		B		155.0	155.0	155.0	155.0	155.0
11-5-27P2	331.00	67.00		B		165.1	170.8	173.7	169.4	167.3
11-5-28B1	198.00	125.00		B		168.0	168.0	168.0	168.0	168.0
11-5-28P4	140.00	80.00		B		165.0	165.0	165.0	165.0	165.0
11-5-31F1	515.00	312.00		B	*	68.6		69.1	67.6	68.0
11-5-33B1	125.00	0.00		B		169.0	169.0	169.0	169.0	169.0
12-5-05M1	0.00	0.00		B		62.5		59.5	36.3	47.7
12-5-06L1	0.00	0.00		B	*	143.5		150.7	140.9	141.6
12-5-07P1	750.00	360.00		B		20.3	36.0	42.0	35.7	36.7
12-5-17D1	950.00	314.00		B		32.0	44.0			
Paicines										
DONATI 6	0.00	0.00		Paicines				616.6	630.5	631.6
RFP Vineyard 3 (FRANCHIONI)	0.00	0.00		Paicines		657.6		652.7	647.7	646.9
RIDGEMARK 5	0.00	0.00		Paicines		622.9			640.6	639.6
RIDGEMARK 7	0.00	0.00		Paicines		627.4		629.1	627.9	628.7
SCHIELDS 2	0.00	0.00		Paicines				737.0	737.0	
SCHIELDS 4 (vineyard)	0.00	0.00		Paicines		623.2		626.7	624.7	625.7
Pacheco Creek										
11-5-12E1	103.00	52.00		PC	*			241.8	240.6	243.3
11-5-13D1	125.00	0.00		PC	*	221.6	235.7	233.2	229.0	229.3
11-5-24C1	134.00	0.00		PC	*	213.3			214.8	213.9
11-5-24C2	165.00	70.00		PC	*	221.2		229.2	225.6	225.9
11-5-24L1	70.00	0.00		PC	*	206.7	213.6	214.5	209.3	212.7
11-5-25G1	225.00	0.00		PC	*	200.3		224.1	220.9	223.0
Tres Pinos Creek Valley										
1536	0.00	0.00		TPCV		278.0	288.0	283.0	279.0	276.0
DONATI 2	0.00	0.00		TPCV		646.4		654.5	653.6	654.6
GRANITE ROCK WELL 1	0.00	0.00		TPCV		282.7		297.1	300.1	299.6
GRANITE ROCK WELL 2	0.00	0.00		TPCV		290.6		327.8	316.6	314.5
San Justo 5 (WINDMILL)	0.00	0.00		TPCV		275.0	274.8	276.3	274.7	273.9
WILDLIFE CENTER 5	0.00	0.00		TPCV		702.0		708.3	704.8	705.6
Llagas										
11S04E02D008	0.00	0.00		SCVWD		142.2	168.2	157.9	133.7	151.4
11S04E02N001	0.00	0.00		SCVWD		139.0	160.9	146.1	115.7	147.0
11S04E03J002	0.00	0.00		SCVWD		142.3	166.6	151.7	126.7	152.5
11S04E08K002	0.00	0.00		SCVWD		144.1		163.2	156.2	152.5
11S04E10D004	0.00	0.00		SCVWD		141.2	163.0	155.4	137.9	143.8
11S04E15J002	0.00	0.00		SCVWD		130.8	144.0	138.1	121.2	133.0
11S04E17N004	0.00	0.00		SCVWD		145.1	167.6	164.7	150.6	153.7
11S04E21P003	0.00	0.00		SCVWD		133.0	149.3	136.1	128.2	139.2
11S04E22N001	0.00	0.00		SCVWD		128.0	144.5	137.8	123.1	134.6
11S04E32R002	0.00	0.00		SCVWD		121.5	135.3	128.9	116.7	128.0

Table C-2. Groundwater Change Attributes

Subbasin	Subbasin Area (Acres)	Average Storativity
San Juan	11,708	0.05
Hollister West	6,050	0.05
Tres Pinos	4,725	0.05
Pacheco	6,743	0.03
Northern Hollister East	10,686	0.03
Southern Hollister East	5,175	0.03
Bolsa SE	2,691	0.08
Bolsa	20,003	0.01

Table C-3. Groundwater Change in Elevation 2016-2017 (feet)

	Average Change in Groundwater Elevation											
Subbasin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
San Juan	0.87	(4.49)	0.29	(0.75)	(1.39)	(0.89)	-	(10.66)	(7.95)	(9.45)	(3.56)	14.57
Hollister West	3.13	(1.69)	3.31	(1.43)	(1.58)	(0.66)	2.12	(5.72)	(17.41)	(3.60)	0.93	6.89
Tres Pinos	2.47	(2.34)	0.72	8.10	(10.52)	0.97	2.54	(2.48)	(6.66)	(6.68)	(6.04)	4.38
Pacheco	1.93	(4.41)	(1.36)	8.10	(6.60)	1.92	(4.36)	(2.95)	(7.37)	1.92	2.98	8.58
Northern Hollister East	3.64	(6.51)	(4.21)	10.15	(8.73)	2.72	(2.36)	1.65	(9.10)	0.76	(1.48)	5.82
Southern Hollister East	3.26	(1.46)	5.45	9.39	4.93	(1.94)	(2.18)	(1.14)	(6.87)	1.61	8.13	0.46
Bolsa SE	1.55	(6.78)	11.51	(24.80)	25.29	(11.65)	0.25	(4.27)	(10.68)	(3.34)	(9.94)	8.21
Bolsa	6.79	(3.30)	8.97	(16.86)	23.15	(11.19)	10.72	(3.37)	(25.56)	4.57	(2.89)	10.62

Table C-4. Groundwater Change in Storage 2006-2017 (acre-feet)

	Average Change in Groundwater Storage (AF)											
Subbasin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
San Juan	510	(2,626)	168	(437)	(811)	(523)	-	(6,239)	(4,653)	(5,530)	(2,086)	8,531
Hollister West	947	(510)	1,001	(431)	(477)	(198)	640	(1,730)	(5,267)	(1,090)	282	2,084
Tres Pinos	584	(553)	169	1,913	(2,485)	228	601	(586)	(1,574)	(1,579)	(1,427)	1,034
Pacheco	391	(892)	(275)	1,639	(1,335)	389	(882)	(597)	(1,490)	388	604	1,736
Northern Hollister East	1,167	(2,087)	(1,350)	3,253	(2,798)	870	(757)	528	(2,918)	242	(474)	1,867
Southern Hollister East	506	(227)	846	1,457	766	(301)	(339)	(177)	(1,067)	250	1,263	72
Bolsa SE	333	(1,458)	2,478	(5,338)	5,443	(2,508)	53	(918)	(2,300)	(719)	(2,139)	1,767
Bolsa	1,358	(659)	1,794	(3,372)	4,631	(2,239)	2,144	(674)	(5,112)	915	(578)	2,125

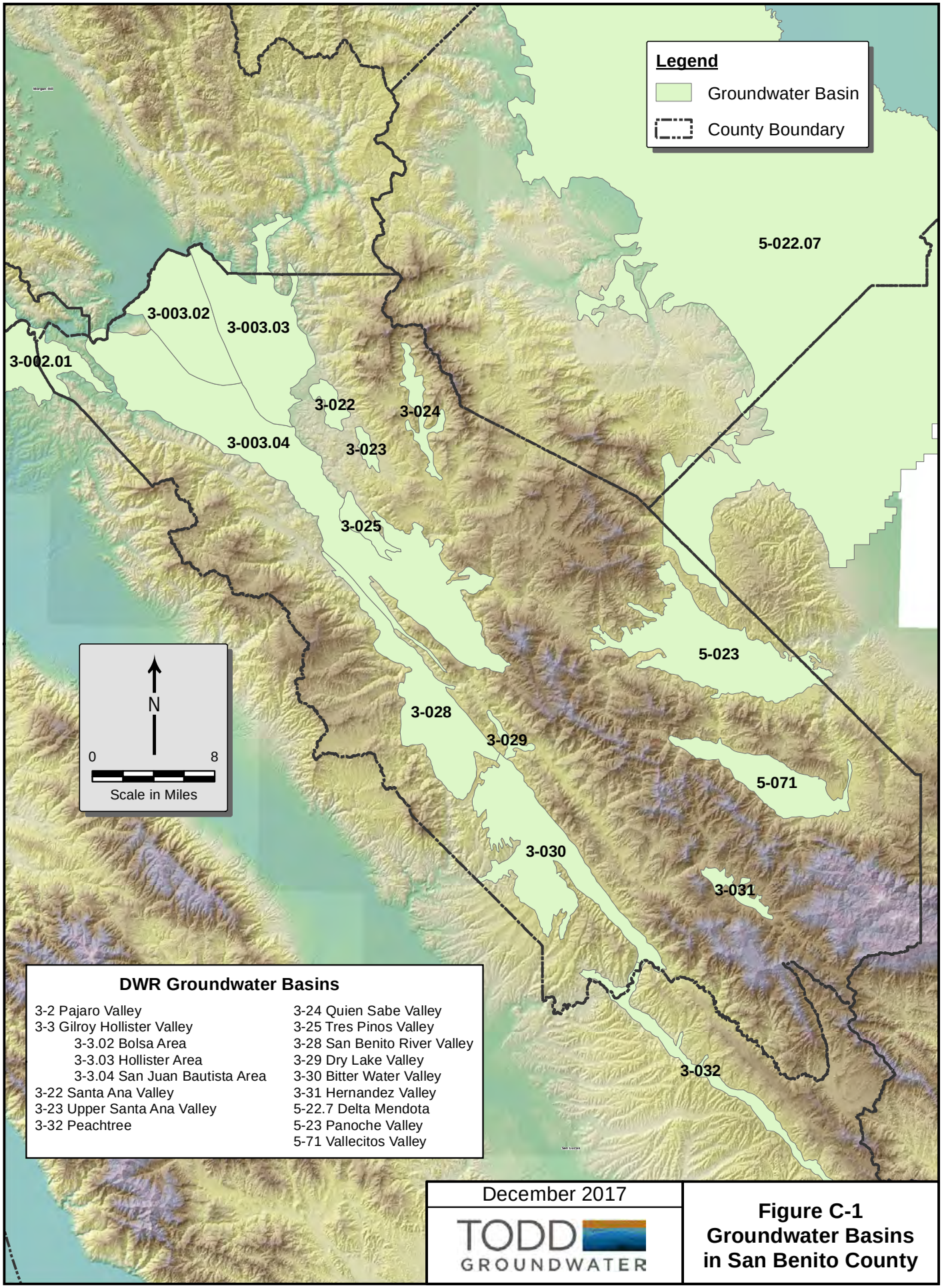

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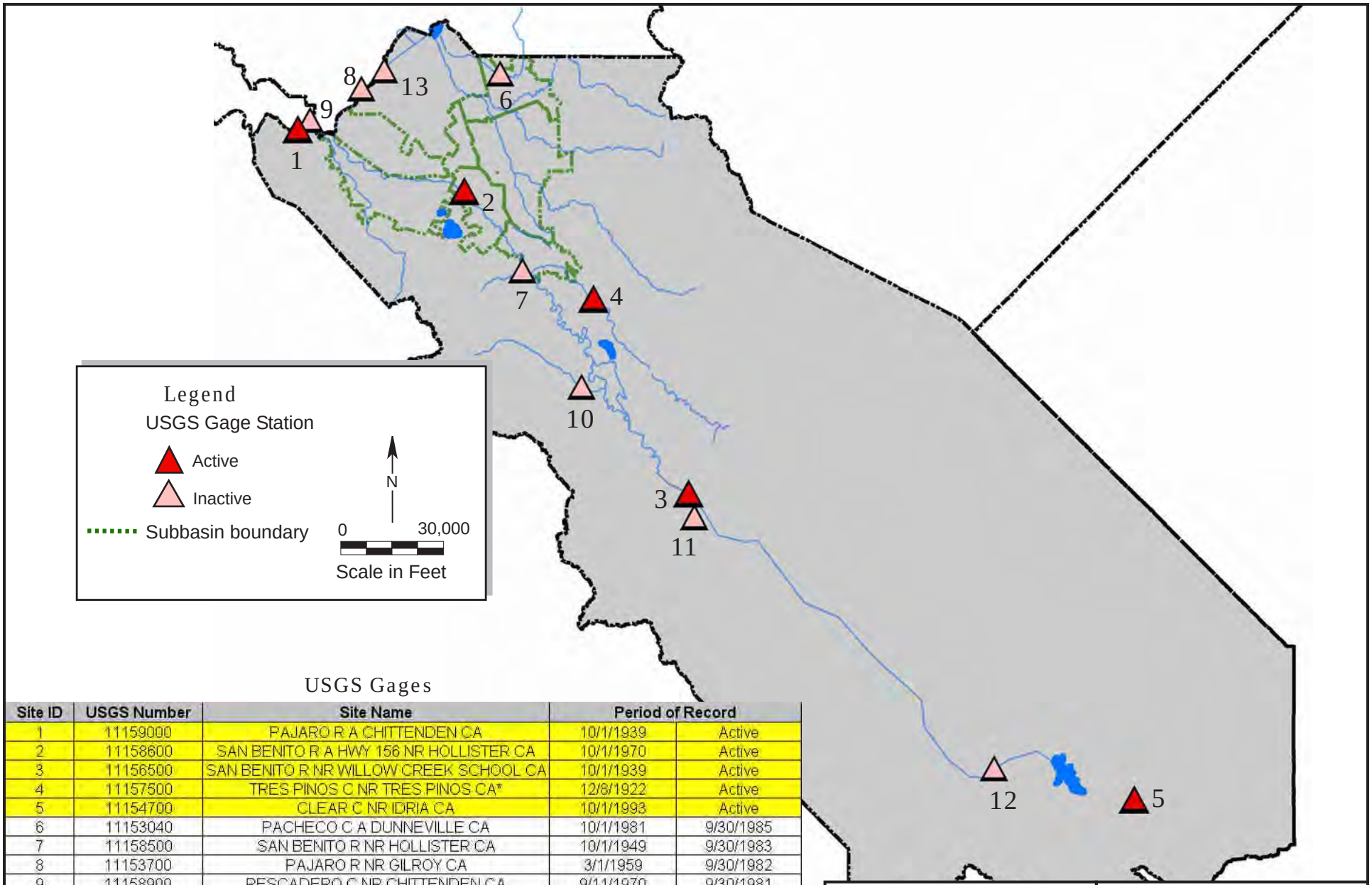
Figure C-1
Groundwater Basins in San Benito County



USGS Gages

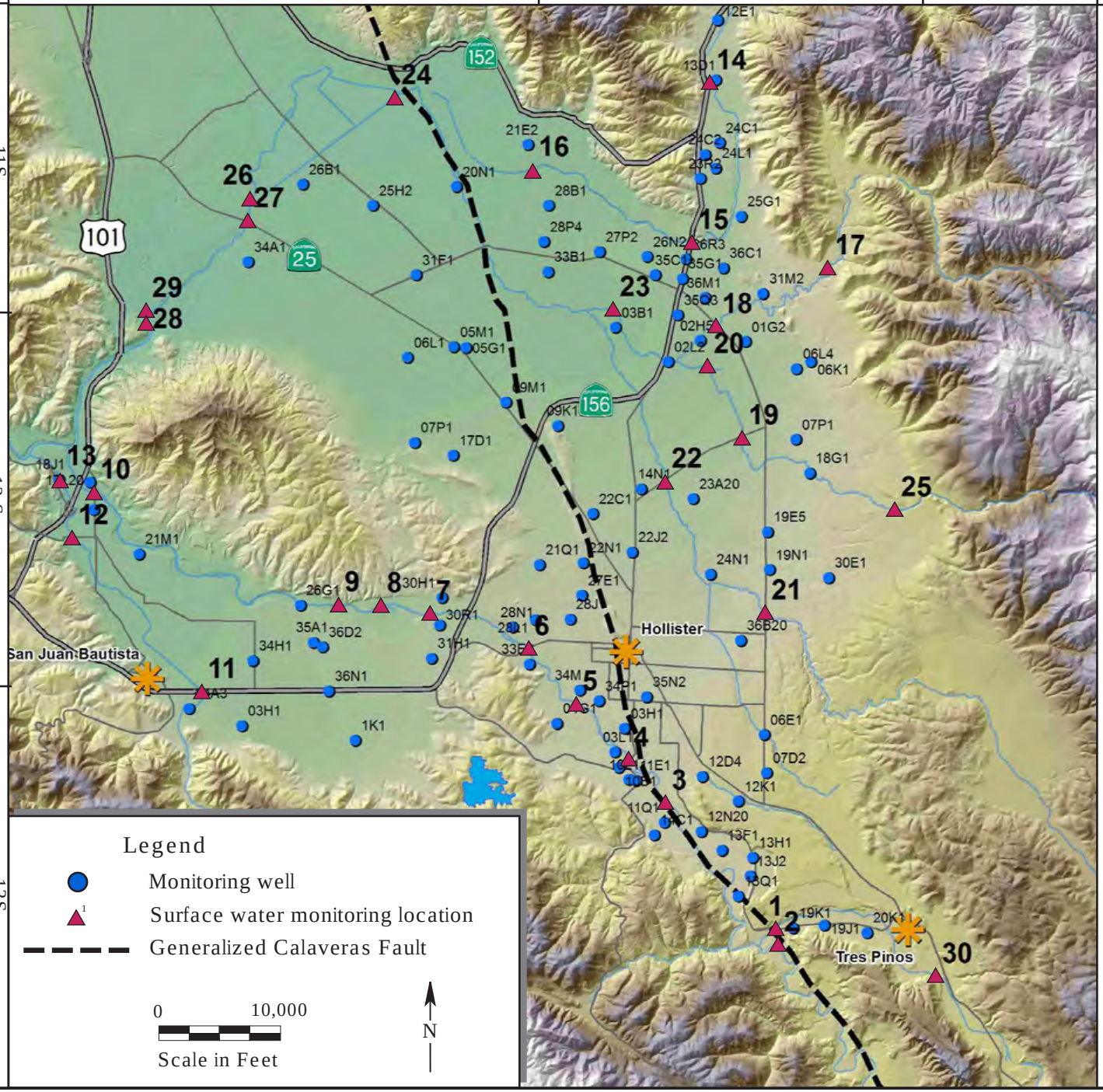
Site ID	USGS Number	Site Name	Period of Record	
1	11159000	PAJARO R A CHITTENDEN CA	10/1/1939	Active
2	11158600	SAN BENITO R A HWY 156 NR HOLLISTER CA	10/1/1970	Active
3	11156500	SAN BENITO R NR WILLOW CREEK SCHOOL CA	10/1/1939	Active
4	11157500	TRES PINOS C NR TRES PINOS CA*	12/8/1922	Active
5	11154700	CLEAR C NR IDRIA CA	10/1/1993	Active
6	11153040	PACHECO C A DUNNEVILLE CA	10/1/1981	9/30/1985
7	11158500	SAN BENITO R NR HOLLISTER CA	10/1/1949	9/30/1983
8	11153700	PAJARO R NR GILROY CA	3/1/1959	9/30/1982
9	11158900	PESCADERO C NR CHITTENDEN CA	9/11/1970	9/30/1981
10	11156700	PESCADERO C NR PAICINES CA	7/1/1959	10/7/1970
11	11156450	WILLOW C TRIB NR SAN BENITO CA	7/1/1964	9/30/1969
12	11156000	SAN BENITO R BL M C NR HERNANDEZ CA	10/1/1949	9/30/1963
13	11154500	PAJARO R A SARGENT CA	10/1/1940	9/30/1941

* WY 2006 data for gage height only

December 2017

TODD GROUNDWATER

Figure C-2
Location of
Streamflow Stations



Surface Water Monitoring Locations

1. Tres Pinos Cr - Southside Road Bridge (West)
2. San Benito River - KT Road bridge
3. San Benito River - Hospital Road
4. San Benito River - Cienega Road
5. San Benito River - Nash Road
6. San Benito River - Old Highway 156
7. San Benito River - near Mitchell Road
8. San Benito River - near Flint Road
9. San Benito River - upstream of Bixby Road
10. San Benito River - Y Road
11. San Juan Creek - - Highway 156
12. San Juan Creek - Anzar Road
13. San Juan Creek - 2000 ft downstream of Highway101
14. Pacheco Creek - Walnut Avenue
15. Pacheco Creek - Highway 156
16. Pacheco Creek - Lovers Lane
17. Arroyo de las Viboras - Hawkins Ranch driveway
18. Arroyo de las Viboras - Fairview Road
19. Arroyo Dos Picachos - Fallon Road
20. Arroyo Dos Picachos - Aquistapace Road
21. Santa Ana Creek - Fairview Road
22. Santa Ana Creek - Fallon Road
23. Tequisquita Sough - San Felipe Road
24. Millers Canal - 2000 ft downstream of San Felipe Lake
25. Arroyo Dos Picachos - Lone Tree Road
26. Pajaro River - above Millers Canal
27. Pajaro River - Highway 25
28. Pajaro River - below Carnadero Creek
29. Carnadero Creek - above Pajaro River
30. Tres Pinos Creek - Bolado Park

Figure C-3
Monitoring Locations

December 2017

TODD GROUNDWATER

Path: T:\Projects\San Benito Annual 37636\2017 Annual Report\GIS\Maps\Figure C-4 - Depth to Water Map Oct 2017.mxd

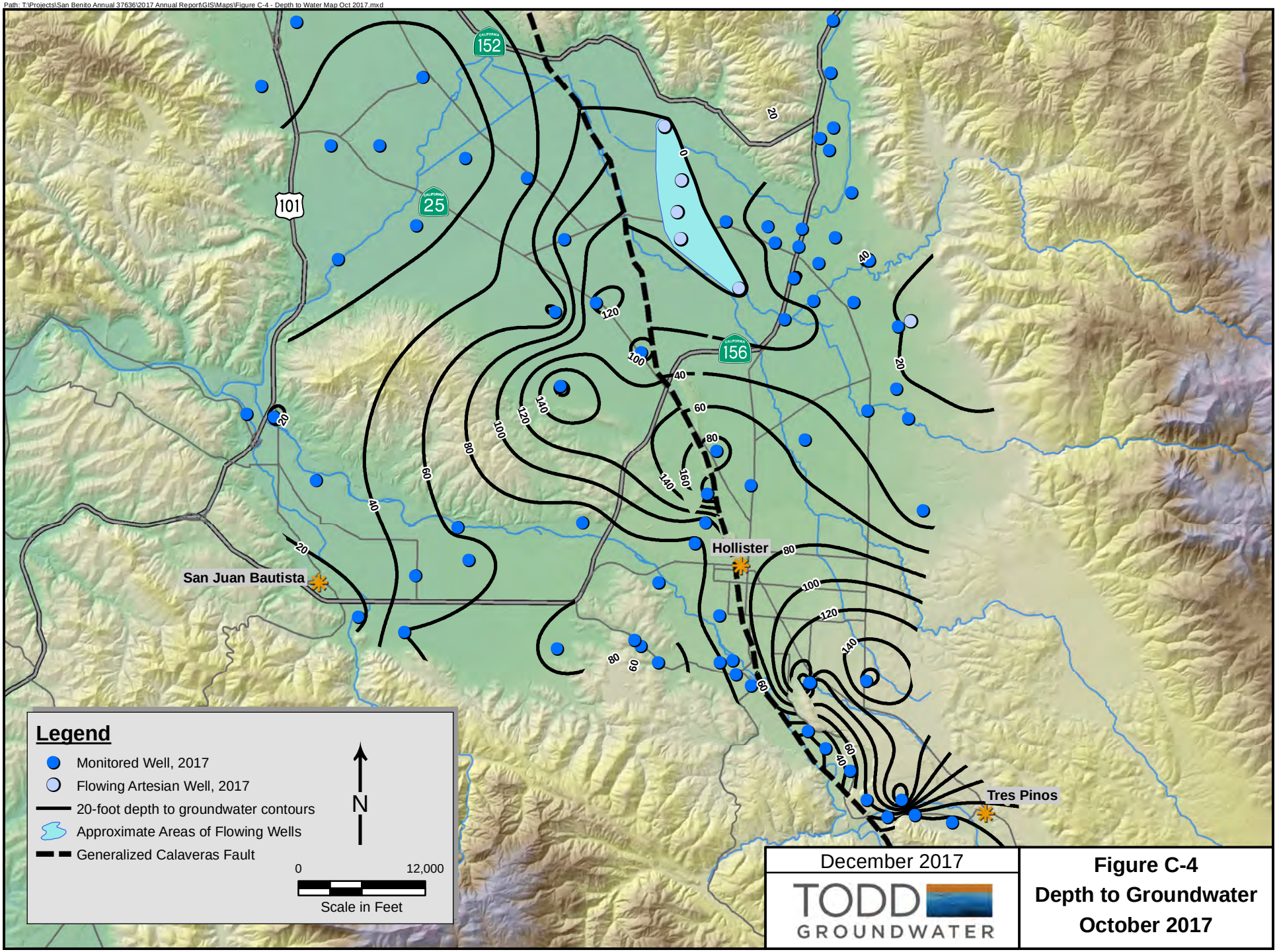


Figure C-4
Depth to Groundwater
October 2017

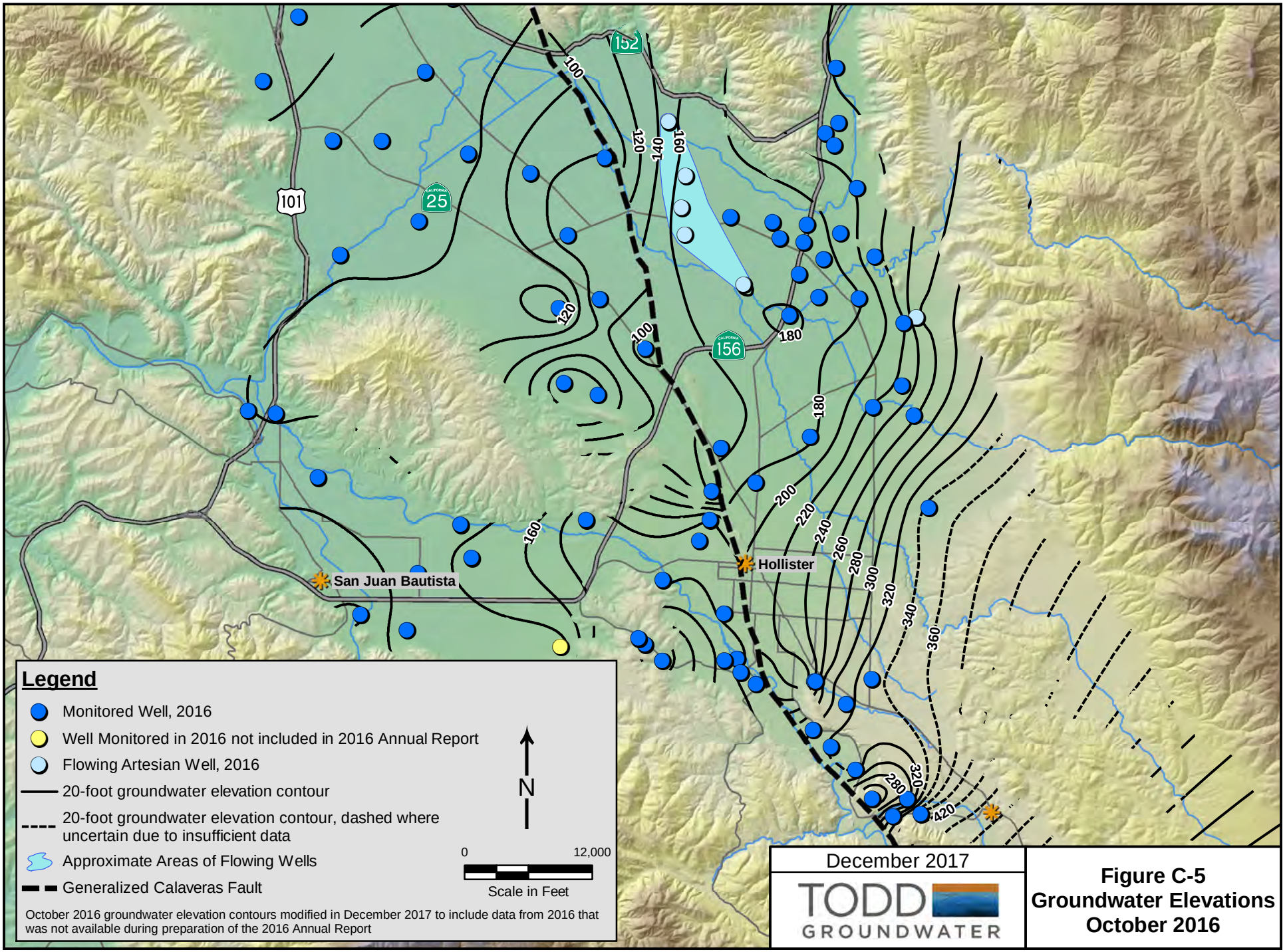
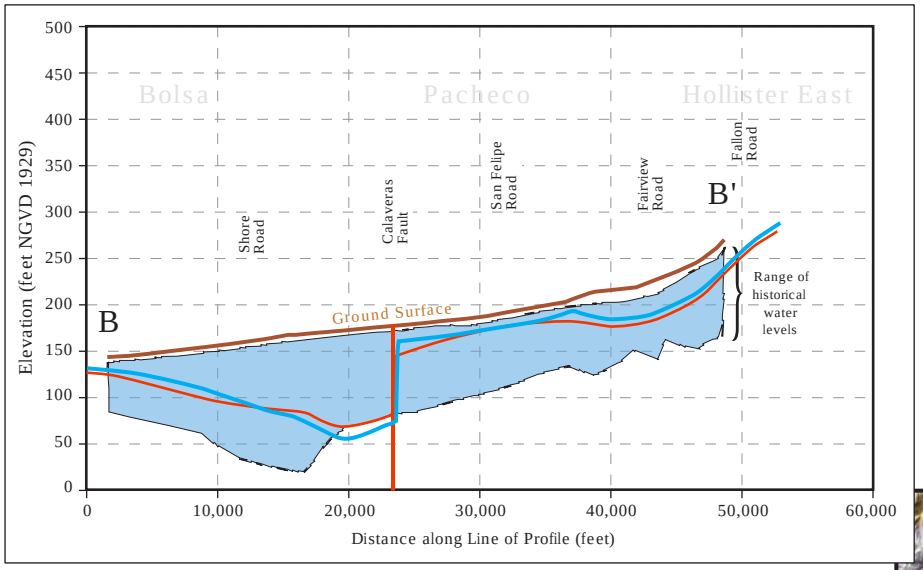
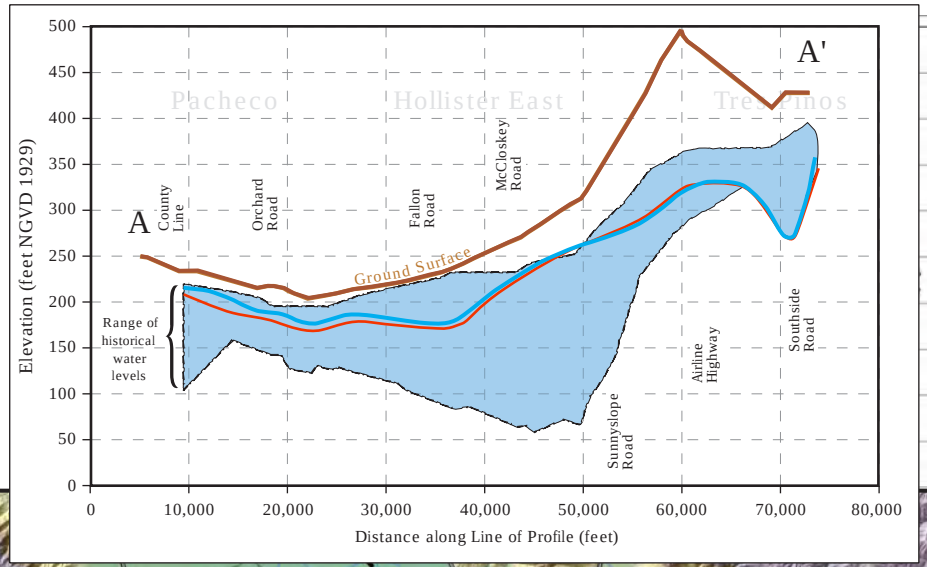
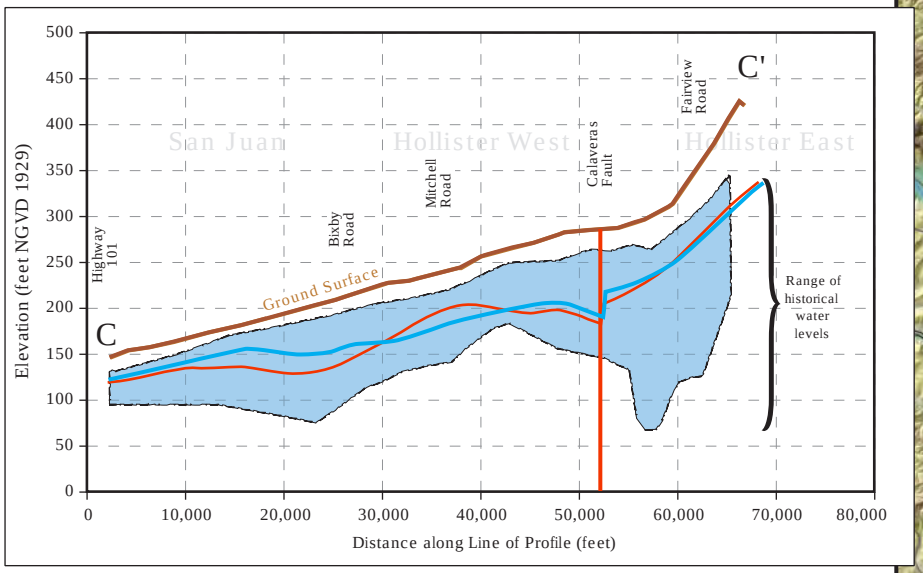
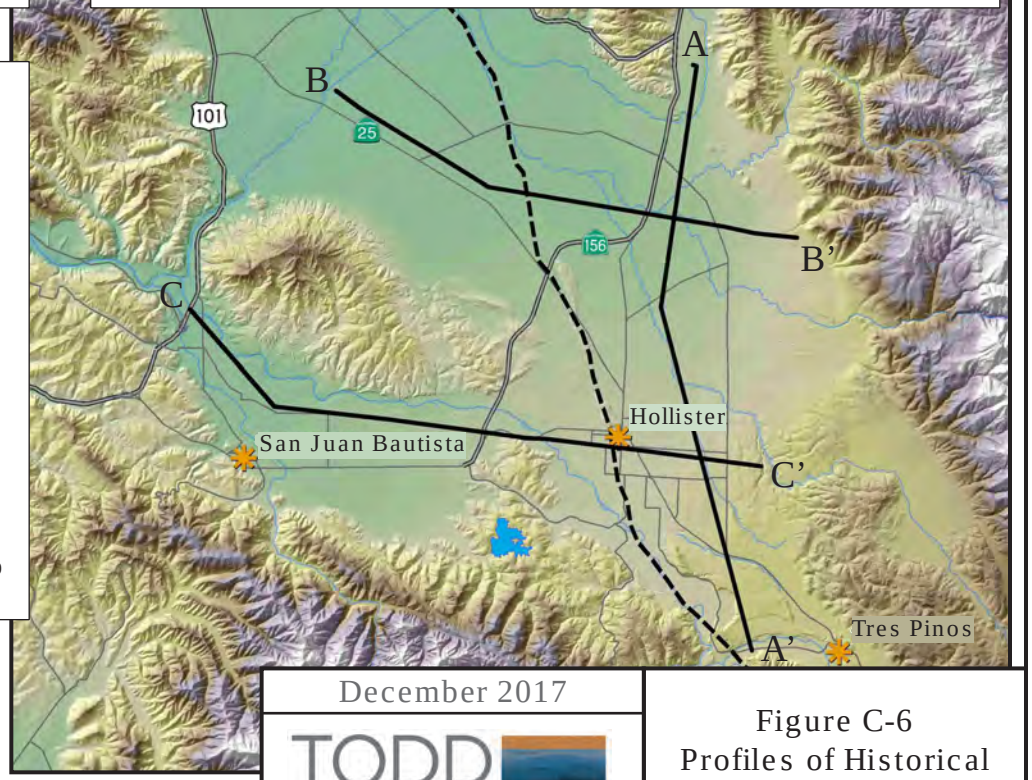


Figure C-5
Groundwater Elevations
October 2016









Legend

- Ground Surface
- Water year 2016
- Water Year 2017
- Range of Historical Water Levels

December 2017

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Figure C-6
Profiles of Historical Groundwater Elevations

D PERCOLATION DATA

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Table D-2. Historical Reservoir Releases (AFY)

Table D-3. Historical Percolation of CVP Water (AFY)

Table D-4. Percolation of Municipal Wastewater during Water Year 2017

Table D-5. Historical Percolation of Municipal Wastewater (AFY)

Figure D-1. Reservoir Releases for Percolation

Figure D-2. Wastewater Percolation by Facility

Table D-1. Reservoir Water Budgets for Water Year 2017 (acre-feet)

	Hernandez	Paicines	San Justo
Inflows			
Rainfall	569	100	300
San Benito River	37,024	2,834	n.a.
Hernandez-Paicines transfer	n.a.	503	n.a.
San Felipe Project	n.a.	n.a.	21,721
Total Inflows	**37,593**	**3,438**	**22,021**
Outflows			
Hernandez spills	-15,006	n.a.	n.a.
Hernandez-Paicines transfer	503	n.a.	n.a.
Tres Pinos Creek percolation releases	n.a.	-2,407	n.a.
San Benito River percolation releases	-23,191	n.a.	-2,209
CVP Deliveries	n.a.	n.a.	-16,131
Evaporation and seepage	846	-736	-1,237
Total Outflows	**-36,847**	**-3,143**	**-19,577**
Storage Change			
Reservoir capacity	17,200	2,870	11,000
Maximum storage	16,952	1,425	10,102
Minimum storage	323	0	4,307
Net water year storage change	**478**	**300**	**1,831**
Unaccounted for Water	**269**	**-5**	**613**

Table D-2. Historical Reservoir Releases (AFY)

WY	Hernandez	Paicines	TOTAL
1996	13,535	6,139	19,674
1997	3,573	2,269	5,842
1998	26,302	450	26,752
1999	12,084	1,293	13,377
2000	13,246	2,326	15,572
2001	12,919	3,583	16,502
2002	9,698	310	10,008
2003	5,434	0	5,434
2004	3,336	0	3,336
2005	19,914	677	20,591
2006	14,112	196	14,308
2007	12,022	1,254	13,276
2008	7,646	495	8,141
2009	4,883	0	4,883
2010	8,484	4,147	12,631
2011	9,757	2,397	12,154
2012	6,341	1,321	7,662
2013	3,963	677	4,640
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	23,191	2,407	25,597
AVG	**9,565**	**1,361**	**10,926**

Table D-3. Historical Percolation of CVP Water (AFY)

Water Year	Pacheco Creek	Arroyo de las Viboras			Arroyo Dos Picachos			Santa Ana Creek				Tres Pinos Creek	San Benito River	Total
		Road	Creek 1	Creek 2	Fallon Road	Jarvis Lane	Creek	John Smith Road	Maranatha Road	Airline Highway	Ridgemark			
1994	232	136	515	0	0	550	209	0	0	0	0	85	158	**1,885**
1995	444	238	770	2	0	654	622	73	0	0	0	809	2,734	**6,345**
1996	0	494	989	832	67	235	708	531	197	134	25	21	6,097	**10,330**
1997	0	447	601	1,981	77	0	200	17	353	286	29	1,477	5,619	**11,087**
1998	0	132	109	403	0	0	0	65	0	158	74	518	1,084	**2,543**
1999	0	0	0	0	0	0	4	256	48	141	10	452	413	**1,322**
2000	1	0	0	6	0	0	3	236	21	240	12	285	938	**1,740**
2001	0	0	0	0	0	0	0	161	17	186	1	703	1,041	**2,110**
2002	0	0	0	2	0	0	1	78	2	143	0	426	470	**1,122**
2003	0	0	0	0	0	0	5	119	9	172	0	163	605	**1,074**
2004	0	0	0	0	0	0	52	83	0	0	0	1	882	**1,018**
2005	0	0	0	0	0	0	0	0	0	0	0	0	527	**527**
2006	0	0	0	0	0	0	7	156	0	0	0	1	451	**614**
2007	0	0	0	0	0	0	0	0	0	0	0	88	216	**304**
2008	0	0	0	0	0	0	0	0	0	0	0	0	6	**6**
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2017*	0	0	340	0	0	0	0	0	0	0	0	0	2,209	**2,549**

*2017 percolation occurred only to recharge basins adjacent to the listed streams.

Table D-4. Percolation of Municipal Wastewater during Water Year 2017

	Pond Area[1] (acres)	Effluent Discharge (acre-feet)	Evaporation[2] (acre-feet)	Percolation (acre-feet)
Hollister - domestic*	92.9	2,211	266	1,945
Hollister - industrial*	39.0	85	28	57
Ridgemark Estates I & II	7.2	175	21	154
Tres Pinos	1.8	25	5	20
Total	141	2,497	320	2,177

Notes:

1. Hollister pond areas are from Dickson and Kenneth D. Schmidt and Associates (1999) and include treatment ponds in addition to percolation ponds at the domestic wastewater treatment plant. Assumes 80% of total pond area in use at any time (Rose, pers. comm.). These areas should be updated as operations change.

2. Average evaporation less precip = 43 inches (56 in/yr evaporation (DWR Bulletin 73-79) less 13 in/yr precip (CIMIS) The IWTP evaportation was adjsuted to account only for when the ponds are in use.

The San Juan Bautista plant is not included because the unnamed tributary of San Juan Creek that receives its effluent usually gains flow along the affected reach and is on the southwest side of the San Andreas Fault. These conditions prevent the effluent from recharging the San Juan Subbasin.

Table D-5. Historical Percolation of Municipal Wastewater (AFY)

	Hollister Reclamation Plant - Domestic	Hollister - industrial	Ridgemark Estates I & II	Tres Pinos	TOTAL
1994	1,775	665	155	5	2,600
1995	1,935	610	180	10	2,735
1996	2,020	689	207	14	2,930
1997	1,965	909	201	17	3,092
1998	2,490	518	231	17	3,256
1999	1,693	1,476	156	12	3,337
2000	2,110	1,136	293	24	3,563
2001	1,742	1,078	303	24	3,147
2002	1,884	1,545	283	24	3,736
2003	2,009	1,432	279	24	3,744
2004	1,787	1,536	268	21	3,612
2005	1,891	1,323	227	26	3,468
2006	1,797	1,211	216	33	3,257
2007	1,740	1,228	139	19	3,126
2008	1,580	1,257	139	19	2,996
2009	1,976	428	172	19	2,594
2010	1,922	37	172	19	2,150
2011	1,807	466	183	19	2,476
2012	1,740	605	177	19	2,541
2013*	889	332	188	21	1,430
2014	1,552	86	179	21	1,838
2015	1,816	344	161	21	2,342
2016	1,923	305	154	21	2,402
2017	1,945	57	154	20	2,177

*Potential missing data

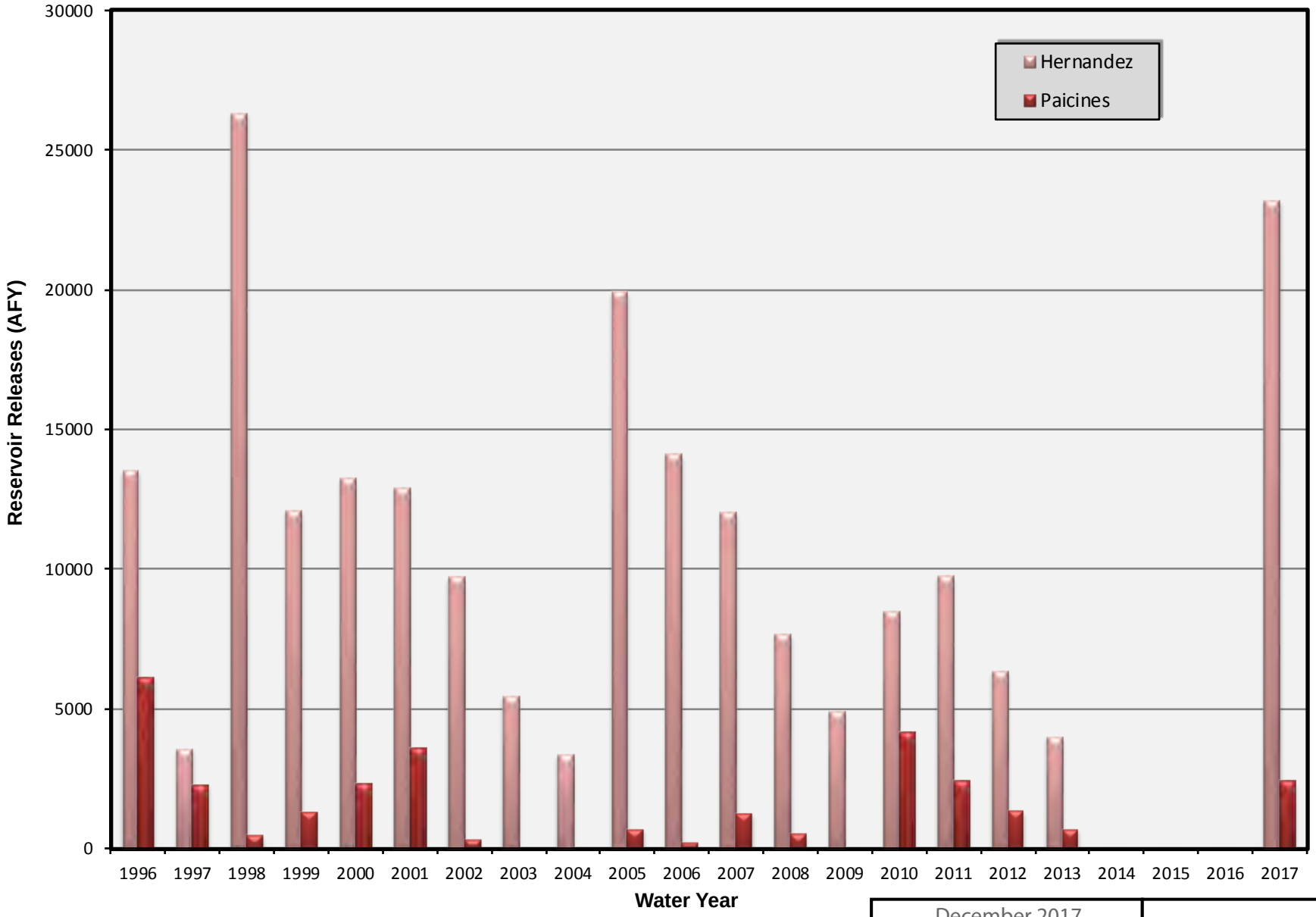

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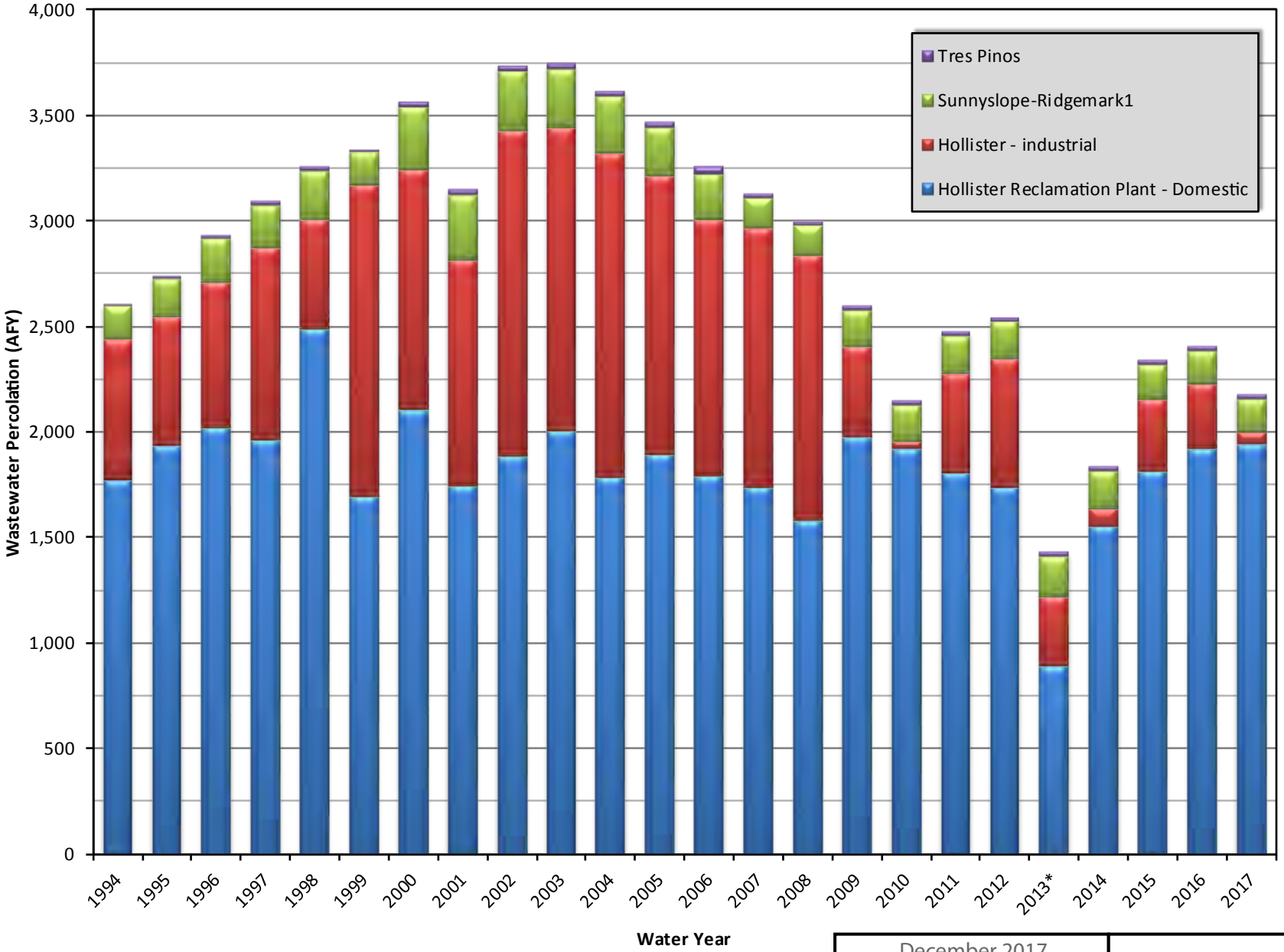
Figure D-1
Reservoir Releases for Percolation



* Potential Missing Data

December 2017

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Figure D-2
Wastewater Percolation by Facility

E WATER USE DATA

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Table E-3. Recent Water Use by Subbasin and User Type (AFY)

Table E-4. Historical Water Use by User Type Zone 6 (AFY)

Table E-5. Municipal Water Use by Purveyor for Water Year 2016 (AF)

Table E-6. Historical Municipal Water Use by Purveyor (AFY)

Figure E-1. Groundwater Percentage of Total Water Use Zone 6

Figure E-2. Water Use in Zone 6 by User Category Zone 6

Figure E-3. Total Subbasin Water Use by Water Type Zone 6

Figure E-4. Annual Total of CVP and Groundwater Use by Type

Figure E-5. Municipal Water Use by Purveyor

Table E-1. Recent CVP Allocation and Use

	Municipal and Industrial (M&I) CVP				Agricultural CVP			
Water Year	Percent of Contract Allocation	Percent of Historic Average	Contract Amount Used (AF)	Contract Amount Used (%)	Percent of Contract Allocation	Percent of Contract and M&I Adjustment[1]	Contract Amount Used (AF)	Contract Amount Used (%)
	(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)		(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)	
2006	100%		3,152	38%	100%		19,840	56%
2007	100%		4,969	60%	40%		18,865	53%
2008	37%	75%	2,232	27%	40%	45%	10,514	30%
2009	29%	60%	1,978	24%	10%	11%	6,439	18%
2010	37%	75%	2,197	27%	45%	50%	10,061	28%
2011	100%		2,433	29%	80%		16,234	46%
2012	51%	75%	2,683	33%	40%	40%	17,267	49%
2013	47%	70%	2,652	32%	20%	22%	12,914	36%
2014	34%	50%	1,599	29%	0%	0%	7,545	21%
2015	25%	25%	1,810	22%	0%	0%	3,697	10%
2016	55%	55%	1,914	23%	5%	0%	4,434	12%
2017	100%	100%	2,909	35%	100%	100%	13,288	37%

Notes:

[1] If the M&I allocation is 75 percent or less, the difference between the M&I contract amount and M&I allocation is added to the agricultural contract amount. The agricultural percentage is multiplied by that sum to obtain the agricultural allocation.

Table E-2. Historical Water Use by Subbasin and Water Source (AFY)

Subbasin	Pacheco		Bolsa Southeast			San Juan		Hollister West			Hollister East			Tres Pinos		Total Zone 6		
Source	GW	CVP	GW	CVP	RW	GW	CVP	GW	CVP	RW	GW	CVP	RW	GW	CVP	GW	CVP	RW
1993	2,251	3,210	3,474	533		9,278	4,300	7,213	90		3,744	7,275		5,658	224	31,618	15,633	-
1994	3,748	3,394	3,467	602		10,859	3,836	7,327	87		5,475	6,808		5,294	263	36,169	14,990	-
1995	2,756	3,474	2,855	720		9,328	4,554	7,092	460		3,428	6,647		4,475	275	29,935	16,130	-
1996	2,533	3,500	2,682	782		8,726	5,187	5,717	679		3,396	8,267		3,695	408	26,748	18,823	-
1997	2,209	4,205	2,755	997		9,587	6,191	7,602	907		3,534	8,284		4,620	466	30,307	21,048	-
1998	2,035	2,165	1,561	361		6,963	4,099	4,991	591		4,037	5,291		3,751	289	23,338	12,796	-
1999	2,553	3,219	2,453	433		9,312	5,990	7,013	726		3,701	7,279		4,199	391	29,231	18,038	-
2000	2,270	3,256	2,418	355		8,681	6,372	7,590	869		3,108	7,279		4,006	542	28,073	18,673	-
2001	1,848	3,443	2,126	411		7,977	7,232	7,377	685		2,213	7,010		3,599	621	25,140	19,402	-
2002	2,322	3,840	2,193	497		7,571	7,242	6,577	706		2,588	7,390		3,994	737	25,244	20,411	-
2003	2,425	3,277	2,175	493		7,434	7,127	6,222	720		1,897	9,329		2,805	788	22,958	21,734	-
2004	2,461	3,607	2,405	740		8,121	7,357	4,971	614		2,321	10,726		3,204	966	23,484	24,010	-
2005	1,320	3,106	1,849	514		6,608	6,245	5,084	680		2,586	9,198		2,378	642	19,825	20,384	-
2006	1,208	3,495	1,864	661		6,741	7,200	4,633	579		2,555	10,253		2,537	803	19,538	22,992	-
2007	1,034	3,832	2,005	572		7,658	6,160	5,118	553		3,867	10,194		2,908	804	22,590	22,115	-
2008	1,900	1,568	2,014	333		7,796	3,160	4,375	399		3,962	6,792		2,743	493	22,789	12,745	-
2009	3,370	1,257	2,082	179		11,956	1,605	4,186	19		4,733	4,697		2,871	447	29,199	8,204	-
2010	2,553	1,771	1,897	207		9,561	3,452	4,081	10	151	4,460	6,056		1,686	488	24,238	11,984	151
2011	1,992	2,420	2,781	229		4,987	5,623	3,940	394	183	1,947	9,575		2,454	427	18,102	18,667	183
2012	3,723	2,652	1,556	288		5,782	5,976	4,298	549	230	2,004	9,917		2,492	568	19,855	19,949	230
2013*	4,157	1,976	2,348	292		11,044	4,134	5,656	374	357	5,430	8,224		2,452	565	31,087	15,566	357
2014	3,303	1,020	2,157	32		10,018	1,984	7,227	233	262	4,872	5,490		3,014	384	30,592	9,144	262
2015	4,279	555	2,401	20		12,739	975	4,730	148	101	7,230	3,568		2,948	241	34,327	5,507	101
2016	4,386	420	2,558	30	38	13,581	819	4,031	162	253	6,383	4,810	207	2,223	106	33,162	6,347	499
2017	2,949	2,097	1,414	365	66	7,542	5,853	3,255	217	108	2,209	7,488	192	2,447	177	19,815	16,197	366
AVG 03-17	2,737	2,203	2,100	330	52	8,771	4,511	4,787	377	206	3,764	7,755	200	2,611	527	24,771	15,703	143

GW = groundwater, CVP = Central Valley Project, RW = recycled water

Table E-3. Recent Water Use by Subbasin and User Type, not including recycled water (AFY)

SUBBASIN	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Agriculture													
Bolsa SE	2,352	2,517	2,570	2,334	2,252	2,103	3,004	1,837	2,635	2,180	2,417	2,601	1,765
Hollister East	8,543	9,526	10,685	8,012	6,860	8,315	9,067	9,453	10,832	8,151	8,464	8,784	7,564
Hollister West	2,128	1,936	2,145	1,509	1,708	1,888	2,190	2,228	3,324	2,584	2,750	2,192	1,338
Pacheco	4,190	4,469	4,573	3,220	4,304	4,242	4,279	6,148	5,990	4,121	4,658	4,616	4,964
San Juan	11,496	12,622	12,185	9,581	12,397	11,960	10,009	10,964	14,376	11,183	13,123	13,826	11,916
Tres Pinos	800	1,004	954	655	670	640	471	641	652	514	1,513	572	468
TOTAL	29,509	32,074	33,112	25,310	28,192	29,148	29,020	30,980	37,810	28,734	32,926	32,591	28,015
M&I													
Bolsa SE	12	8	7	13	9	0	6	6	4	9	5	25	14
Hollister East	3,241	3,280	3,203	2,742	2,570	2,201	2,455	2,469	2,822	2,211	2,334	2,617	2,132
Hollister West	3,636	3,168	3,361	3,265	2,710	2,477	2,144	2,619	2,705	4,876	2,128	2,254	2,134
Pacheco	235	234	293	248	323	83	133	227	144	203	176	191	81
San Juan	1,356	1,320	1,640	1,375	1,164	1,053	601	793	803	820	590	574	1,479
Tres Pinos	2,220	2,336	2,748	2,581	2,648	3,048	2,410	2,710	2,365	2,884	1,676	1,757	2,156
TOTAL	10,700	10,345	11,252	10,225	9,424	8,862	7,749	8,825	8,843	11,002	6,909	7,417	7,997

Table E-4. Historical Water Use by User Type (AFY)

WY	Agricultural	Municipal, and Industrial	Total	% Ag
1988	45,366	5,152	50,518	90%
1989	32,387	6,047	38,434	84%
1990	49,663	5,725	55,388	90%
1991	46,640	7,631	54,271	86%
1992	32,210	6,912	39,122	82%
1993	38,878	5,066	43,944	88%
1994	41,854	7,186	49,040	85%
1995	36,399	8,272	44,671	81%
1996	39,575	8,338	47,913	83%
1997	41,482	11,117	52,599	79%
1998	27,526	8,650	36,176	76%
1999	37,203	10,110	47,313	79%
2000	36,062	10,811	46,873	77%
2001	34,035	10,687	44,722	76%
2002	34,354	11,347	45,701	75%
2003	33,533	11,206	44,739	75%
2004	35,597	11,944	47,541	75%
2005	29,509	10,700	40,209	73%
2006	32,074	10,345	42,419	76%
2007	33,112	11,252	44,364	75%
2008	25,310	10,225	35,535	71%
2009	28,192	9,424	37,616	75%
2010	29,148	8,862	38,010	77%
2011	29,020	7,749	36,769	79%
2012	31,270	8,825	40,095	78%
2013	37,810	8,843	46,653	81%
2014	28,734	11,226	39,960	72%
2015	32,926	7,010	39,935	82%
2016	32,591	7,417	40,008	81%
2017	28,015	7,997	36,012	78%
AVERAGE	**34,682**	**8,869**	**43,552**	**79%**

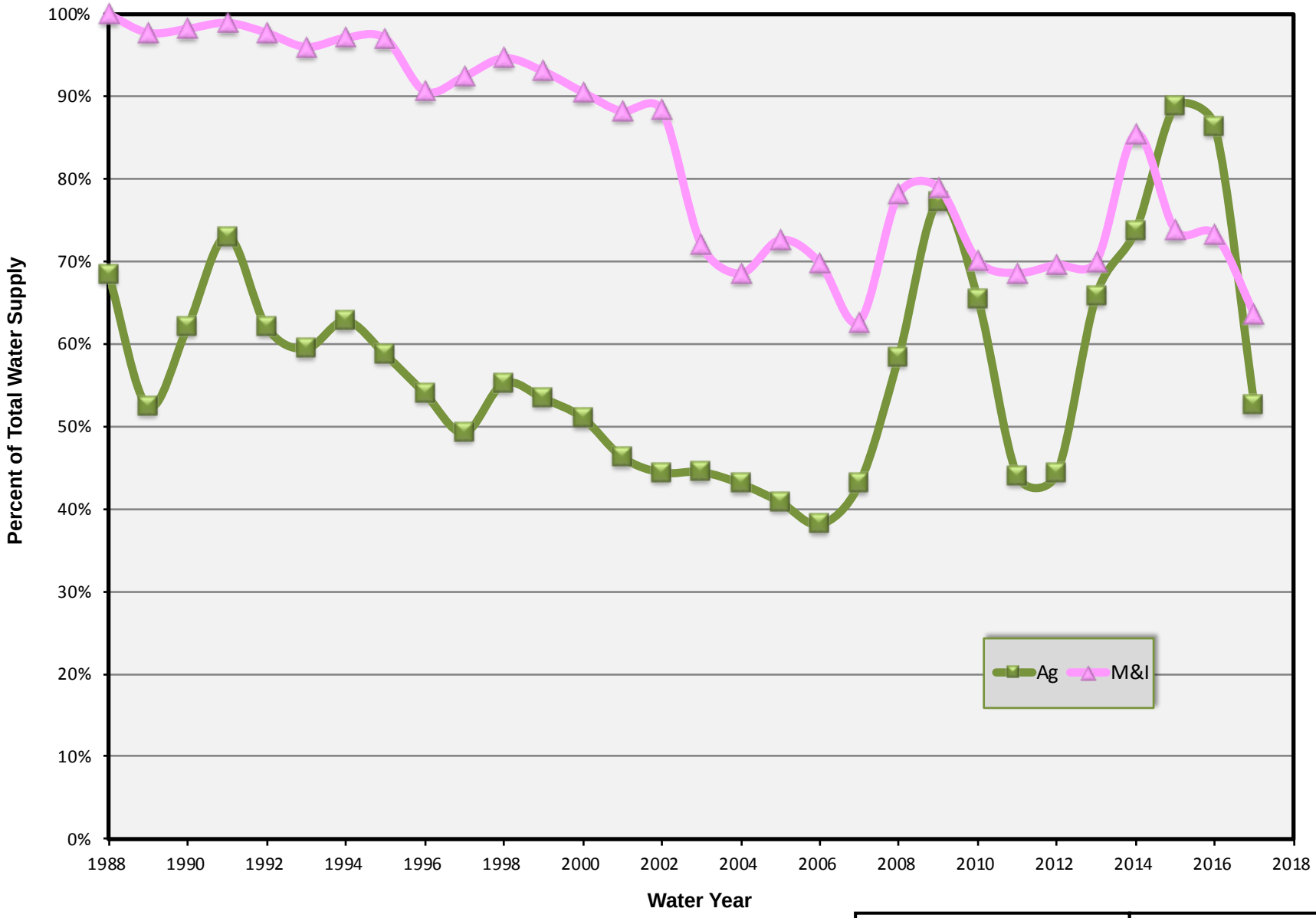
Table E-5. Municipal Water Use by Purveyor for Water Year 2017 (AF)

	WY 2017	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Groundwater													
Sunnyslope CWD	**1,449**	190	78	58	72	56	39	71	111	168	226	199	180
City of Hollister	**1,543**	145	110	97	92	66	66	84	166	208	123	221	166
City of Hollister - Cienega Wells	**79**	9	9	10	9	7	10	9	9	6	1	0	1
San Juan Bautista	**249**	19	18	15	13	-	15	16	25	31	33	32	31
Tres Pinos CWD	**32**	3	2	2	2	2	2	2	3	3	4	3	3
Groundwater Subtotal	**3,352**	**367**	**218**	**181**	**188**	**130**	**131**	**182**	**314**	**417**	**387**	**456**	**382**
CVP Imported Water													
Lessalt Treatment Plant	**1,940**	168	146	123	145	127	163	189	172	178	200	168	162
West Hills Treatment Plant	**51**	0	0	0	0	0	0	0	0	0	0	0	51
Imported Water Subtotal	**1,991**	**168**	**146**	**123**	**145**	**127**	**163**	**189**	**172**	**178**	**200**	**168**	**213**
Municipal Total													
Municipal Water Supply Total	**5,344**	**534**	**364**	**304**	**332**	**258**	**294**	**370**	**487**	**594**	**586**	**624**	**595**

Table E-6. Historical Municipal Water Use by Purveyor (AFY)

WY	Sunnyslope CWD - GW	City of Hollister - GW	City of Hollister - Cienega Wells[1]	San Juan Bautista	Tres Pinos CWD	Lessalt Treatment Plant	West Hills Lessalt Treatment Plant	Undivided Total	TOTAL
1988						0		5,152	**5,152**
1989						0		6,047	**6,047**
1990						0		5,725	**5,725**
1991						0		7,631	**7,631**
1992						0		6,912	**6,912**
1993						0		5,066	**5,066**
1994						0		7,186	**7,186**
1995	2,167	2,446				0			**4,613**
1996	2,139	3,386				0			**5,525**
1997	2,638	3,848				0			**6,486**
1998	2,357	3,441				0			**5,798**
1999	2,820	3,558				0			**6,378**
2000	3,214	4,021				0			**7,235**
2001	3,290	3,851				0			**7,141**
2002	3,256	4,120				21			**7,398**
2003	2,053	2,754				2,494			**7,302**
2004	2,426	2,828				2,101			**7,356**
2005	1,959	3,147	123	247	49	1,843			**7,368**
2006	1,907	2,801	123	150	49	1,900			**6,930**
2007	2,413	2,758	123	47	49	1,719			**7,108**
2008	2,294	2,746	123	417	47	1,323			**6,949**
2009	2,251	2,503	123	373	47	1,212			**6,509**
2010	1,861	2,194	108	308	47	1,344			**5,861**
2011	2,225	1,651	80	292	47	1,593			**5,887**
2012	2,360	1,761	130	267	45	1,657			**6,219**
2013	1,655	2,655	120	281	46	1,648			**6,405**
2014	2,134	2,646	114	285	49	979			**6,207**
2015	1,348	1,960	114	225	49	1,364			**5,060**
2016	1,331	1,615	105	232	49	1,682			**5,014**
2017	1,449	1,543	79	249	32	1,940	51		**5,344**

1. Data from Hollister Cienega Wells for 2005-2008 was estimated to be the same as WY 2009
Cells with no data indicate that the information is unavailable, while years with no use are shown explicitly as 0's.



December 2017

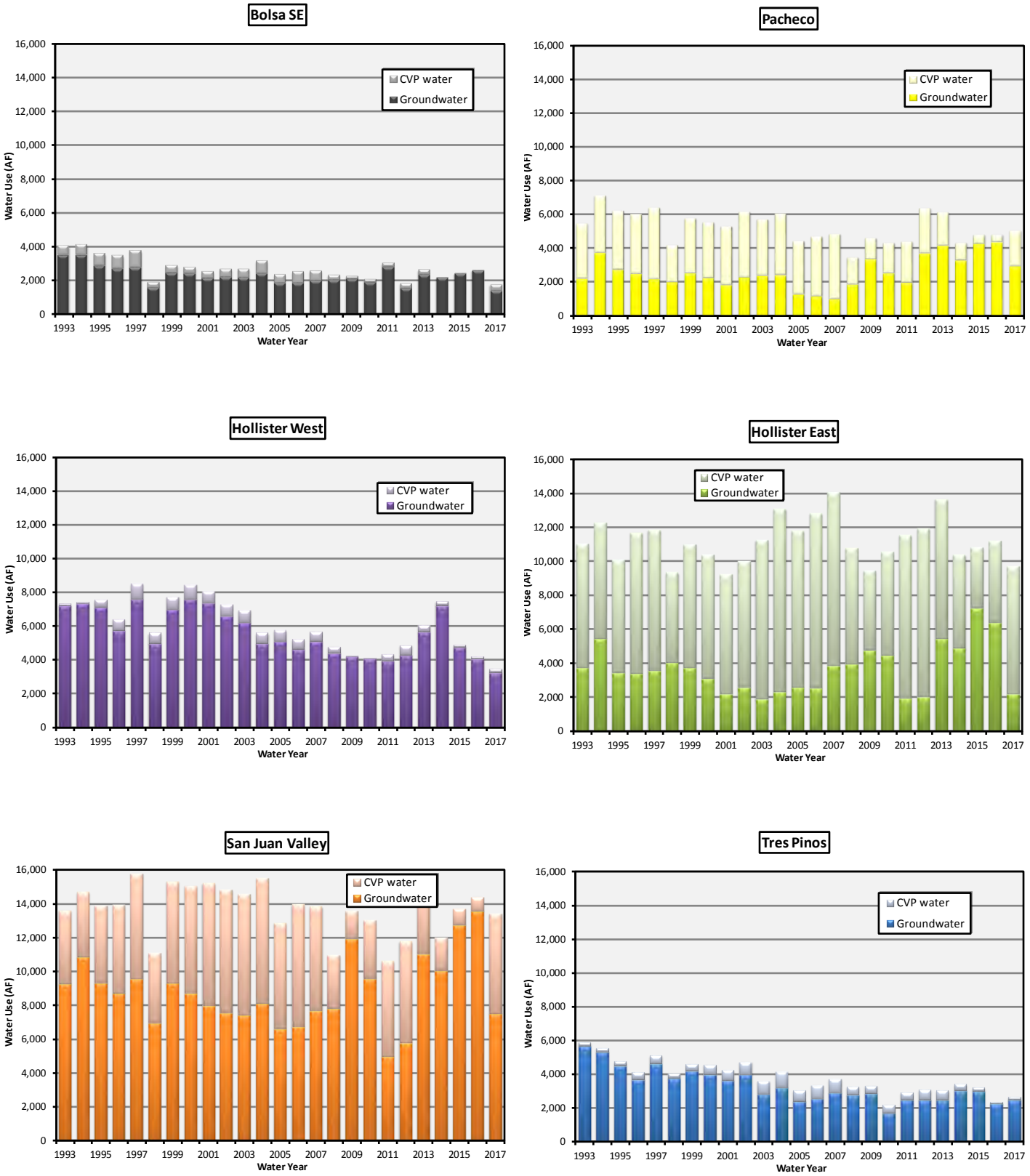
TODD GROUNDWATER

Figure E-1
Groundwater Percentage of Total Water Use

December 2017

TODD GROUNDWATER

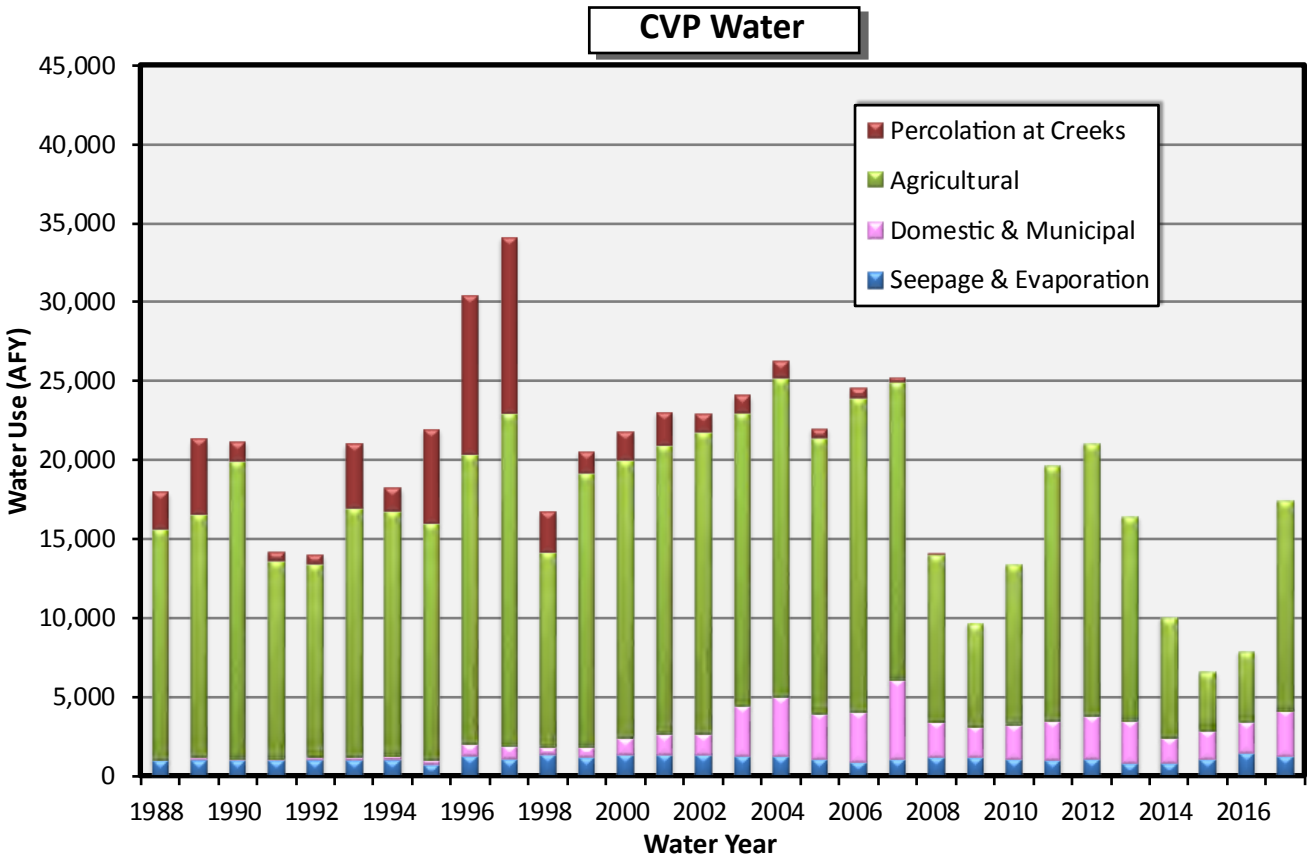
Figure E-2
Water Use in Zone 6 by User Category

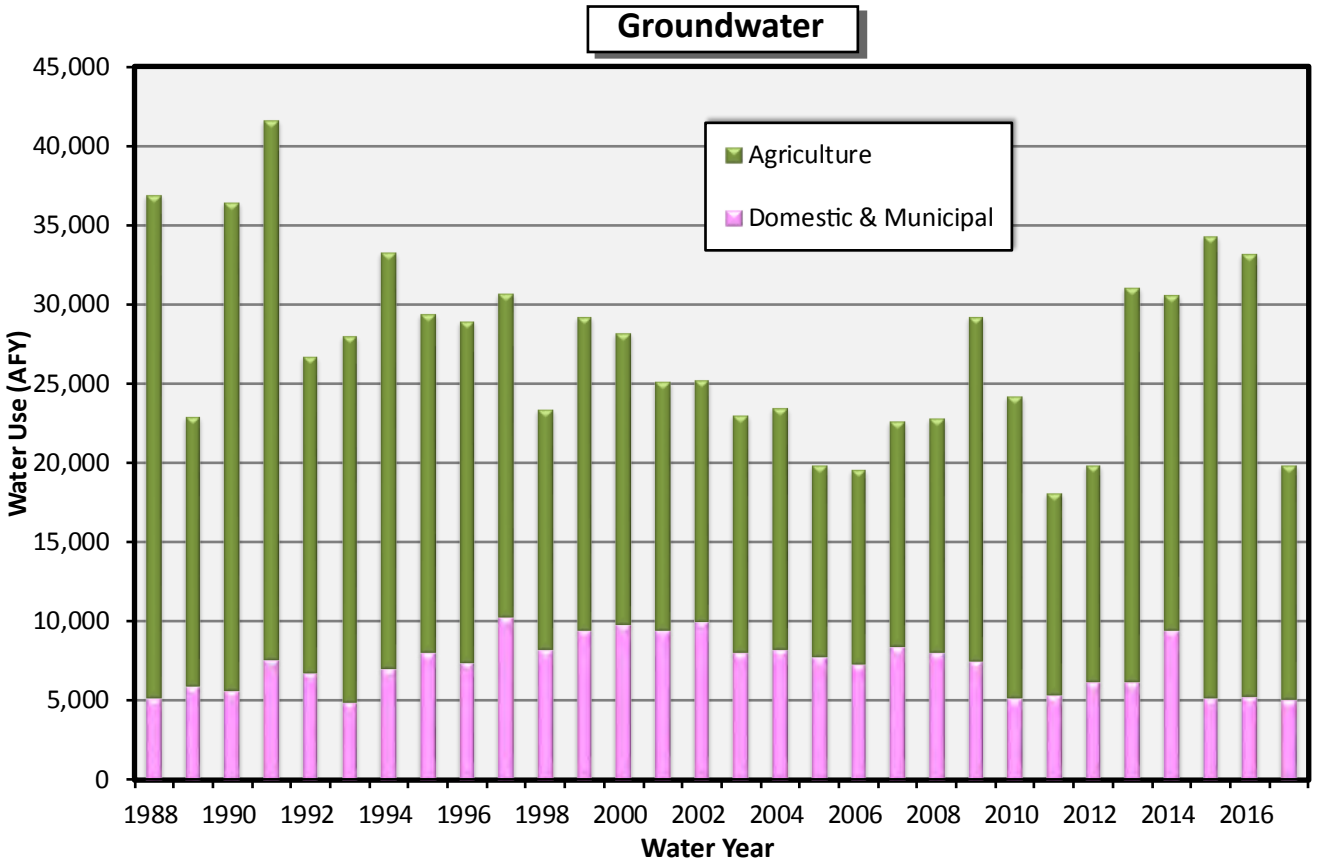


December 2017

TODD GROUNDWATER

Figure E-3
Total Subbasin Water Use by Water Type

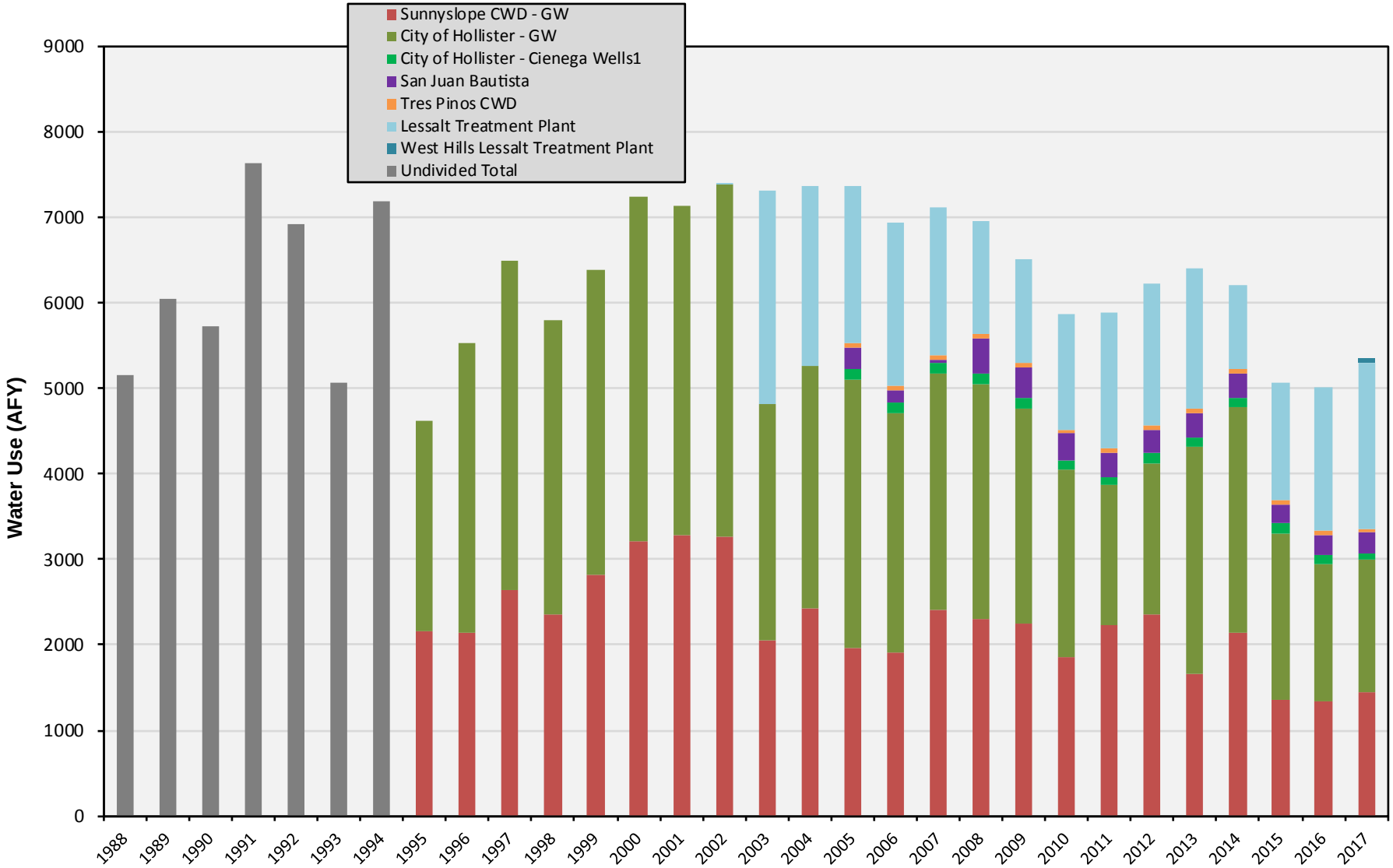




December 2017

TODD GROUNDWATER

Figure E-4
Annual Total of CVP and Groundwater by Use



December 2017

TODD GROUNDWATER

Figure E-5
Municipal Water Use by Purveyor

F RATES AND CHARGES

List of Tables and Figures

Table F-1. Historical and Current District CVP (Blue Valve) Water Rates (dollars/AF)

Table F-2. 2017 Recommended Groundwater Revenue Requirement/Charges (USBR Water Year 2018-2019)

Table F-3. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

Table F-1. Historical and Current San Benito County Water District CVP (Blue Valve) Water Rates (dollars/af)

USBR Water Year	Standby & Availability Charge (dollars/acre)	Water Charge		Power Charge					Groundwater Charge (dollars/af)			Recycled Water (per AF)	
		Agricultural	Municipal & Industrial	Distribution Subsystem					Agricultural	Municipal & Industrial		Agricultural	Power Charge
				2	6H	9L	9H	Others					
1987	$8.00	$34.00	n.c.						n.i.	n.i.			
1988	$2.00	$34.00	n.c.						n.i.	n.i.			
1991	$4.00	$38.00	$110.00						$6.25	$22.00			
1992	$4.00	$45.00	$120.00						$2.00	$10.00			
1994	$4.50	$77.61	$168.92						$1.00	$5.00			
1995	$4.50	$77.61	$168.92						$1.00	$15.75	First 100 af		
										$36.70	Next 500 af		
										$54.60	Over 600 af		
1996	$6.00	$75.00	$150.00						$1.50	$33.00			
1997	$6.00	$75.00	$157.00						$1.50	$33.00			
1998	$6.00	$75.00	$155.00						$1.50	$33.00			
2000	$6.00	$75.00	$155.00						$1.50	$11.50			
2001	$6.00	$75.00	$155.00						$1.50	$25.00			
2004	$6.00	$75.00	$150.00	$24.30	$46.75	$25.05	$53.70	$15.25	$1.50	$10.00			
2005	$6.00	$80.00	$150.00	$26.15	$49.40	$35.00	$66.90	$17.10	$1.50	$21.50			
2006	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50			
2007	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50			
2008	$6.00	$100.00	$170.00	$17.25	$19.40	$32.60	$62.75	$14.85	$1.50	$21.50			
2009	$6.00	$115.00	$180.00	$17.50	$20.25	$42.55	$74.85	$16.30	$2.50	$22.50			
2010	$6.00	$135.00	$200.00	$22.00	$27.30	$49.75	$84.35	$21.75	$2.50	$22.50			
2011	$6.00	$155.00	$220.00	$22.70	$28.15	$51.25	$86.90	$22.40	$2.50	$22.50			
2012	$6.00	$170.00	$235.00	$23.35	$29.00	$52.80	$89.50	$23.10	$2.50	$22.50			
2013	$6.00	$170.00	$235.00	$40.30	$29.25	$43.05	$91.55	$22.40	$3.25	$23.25			
2014	$6.00	$170.00	$238.00	$41.55	$30.15	$44.35	$94.30	$23.10	$3.60	$23.25			
2015	$6.00	$179.00	$247.00	$42.75	$31.05	$45.70	$97.15	$23.80	$3.95	$23.25			
2016	$6.00	$272.00	$363.00	$123.10	$75.65	$109.95	$162.55	$66.05	$4.95	$24.25		$182.55	$57.70
2017	$6.00	$191.00	$363.00	$126.80	$77.90	$113.25	$167.45	$68.05	$6.45	$24.25		$183.45	$59.45

Notes:

af = acre-feet.
n.c. = no classification.
n.i. = not implemented
All rates effective March 1 through following February.

Table F-2. 2016 Recommended Groundwater Revenue Requirement/Charges

REVENUE REQUIREMENTS					Rates [2]	
	Component	Rate ($/AF)	Quantity[1] (af)	Amount	Ag	M & I
Source of Supply						
Ag	Source of Supply Costs	$9.41	22,438	$ 211,222	$ 9.41	
M&I	Source of Supply Costs	$28.24	5,725	$ 161,679		$ 28.24
Percolation Costs						
Ag	CVP Water Rate[3]	$299.64	-	$ -		
M&I	CVP Water Rate[3]	$410.76	-	$ -		
Ag	Power Charge for Percolation	$0.00	-	0	$ -	
M&I	Power Charge for Percolation	$0.00	-	0		$ -
Calculated Total					$ 9.41	$ 28.26
Previous Groundwater Charge (per acre foot)					$ 6.45	$ 24.25
CURRENT AND RECOMMENDED CHARGES (per acre foot)					**$ 7.95**	**$ 24.25**

1 Assumed Volumes
Percolation (based on average of last 3 years of recharge
Groundwater Usage (based on average of past 3 years)
2 Rates=Revenue Requirement/projected usage
3 CVP water rate basis for 2018-2019 water year

Note: Section 70-7.8 (a) of the District Act states that the agricultural rate shall not exceed one-third of the rates for all water other than agricultural water.

Table F-3. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

	Irrigation[1]						Municipal & Industrial					
User Category and Cost Item	Cost of service (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]	Cost of service[2] (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]
1994	$71.68	$6.20	n.a.		$77.88	$17.21	$165.67	$12.40	n.a.		$178.07	$85.86
1995	$66.47	$6.35	n.a.		$72.82	$17.21	$132.90	$12.69	n.a.		$145.59	$85.86
1996	$65.63	$6.53	n.a.		$72.16	$27.46	$127.40	$13.06	n.a.		$140.46	$85.86
1997	$69.57	$6.70	n.a.		$76.27	$27.46	$143.27	$13.39	n.a.		$156.66	$85.86
1998	$61.58	$6.88	$5.00		$73.46	$27.46	$130.88	$13.76	$5.00		$149.64	$85.86
1999	$60.30	$6.98	$2.73		$70.01	$27.46	$127.91	$13.96	$2.73		$144.60	$85.86
2000	$64.24	$7.10	$6.43		$77.77	$27.46	$129.59	$14.20	$6.43		$150.22	$85.86
2001	$69.50	$7.28	$2.65		$79.43	$27.46	$129.40	$14.56	$4.15		$148.11	$85.86
2002	$68.71	$7.54	$6.61		$82.86	$24.30	$130.32	$15.08	$6.61		$152.01	$79.13
2003	$72.20	$7.69	$5.46		$85.35	$24.30	$129.07	$15.38	$5.46		$149.91	$79.13
2004	$74.52	$7.82	$6.61		$88.95	$24.30	$134.86	$15.64	$6.61		$157.11	$79.13
2005	$77.10	$7.93	$7.99		$93.02	$24.30	$132.01	$15.87	$7.99		$155.87	$79.13
2006	$91.13	$8.24	$9.31		$108.68	$30.93	$214.41	$16.49	$9.31		$240.21	$77.12
2007	$93.53	$8.58	$9.99	$0.11	$112.21	$30.93	$215.32	$17.15	$9.99	$0.11	$242.46	$80.08
2008[6]	$28.12	$8.79	$10.95	$0.07	$47.93	$30.93	$33.34	$17.57	$10.95	$0.07	$61.68	$33.34
2009	$30.20	$9.06	$11.49	$0.07	$50.82	$30.20	$32.77	$18.12	$11.49	$0.07	$62.45	$32.77
2010	$33.27	$9.11	$11.91	$0.11	$54.40	$33.27	$36.11	$18.23	$11.91	$0.11	$66.36	$36.11
2011	$38.92	$9.29	$9.51	$0.05	$57.77	$38.92	$42.58	$18.59	$9.51	$0.05	$70.73	$42.58
2012	$39.71	$9.39	$15.20	$0.05	$64.35	$39.71	$37.95	$18.78	$15.20	$0.05	$71.98	$37.95
2013	$40.39	$9.79	$17.29	$0.05	$67.52	$39.91	$38.71	$19.58	$17.29	$0.05	$75.63	$40.92
2014	$46.87	$9.99	$28.81	$0.23	$85.90	$46.87	$29.70	$19.98	$28.81	$0.23	$78.72	$29.70
2015	$53.82	$10.07	$30.66	$0.23	$94.78	$53.82	$34.74	$20.14	$30.66	$0.23	$85.77	$34.74
2016	$85.12	$10.07	$30.66	$0.23	$126.08	$53.82	$61.24	$20.14	$30.66	$0.23	$112.27	$34.74
2017	$66.17	$10.23	$14.15	$0.30	$90.85	$39.90	$49.50	$20.45	$14.15	$0.30	$84.40	$22.85

Notes:

(1) Total USBR rate given for non-full cost users only, as they represent the majority of water users.

(2) Cost-of-service for agricultural and municipal and industrial users includes a capital repayment rate and an operation and maintenance (O&M) rate. For municipal and industrial customers, cost-of-service also includes a deficit charge, which includes interest on unpaid O&M and interest on capital and on unpaid deficit.

(3) Restoration fund charges apply October 1 through September 30.

(4) Beginning in 1998, the San Luis-Delta Mendota Water Authority instituted this charge to "self-fund" costs associated with maintaining the Delta-Mendota Canal and certain other facilities, which were formerly funded directly by the Bureau of Reclamation. SLDMWA issues preliminary rates in December for the upcoming contract year (March-February). These rates are used for rate-setting purposes; actual rates may vary.

(5) The contract rate is the minimum rate CVP contractors are allowed to pay. To the extent that the contract rate does not cover interest plus actual operation and maintenance costs, a contractor deficit is accumulated that is charged interest at the current-year treasury borrowing rate.

(6) Per the amendatory contract with the USBR "out of basin" capital costs that were previously included in the cost of service are now under a separate repayment contract.

(7) Cost of service rates are inclusive of USBR direct pumping and Project Use Energy costs.

G WATER BALANCE

Water Balance Methodology

Annual groundwater balances for water years 2015, 2016 and 2017 were developed for this annual report. Water balance information is required for effective water resources management. The relative magnitude of each water balance element and its changes over time illustrate the mechanisms at work in the basin. The water balance supports decisions related to groundwater replenishment and withdrawals.

The water balance table for each year lists inflows and outflows by subbasin in the same format as in prior annual reports. Any water balance analysis includes uncertainty, which derives from potential errors in data measurement and recording and from necessary use of assumptions when data are lacking. To address uncertainty, items in the water balance tables are estimated using various *independent* methods; combining the estimates into a single table can reveal errors or uncertainty in assumptions or data.

As an additional check on consistency, the tables include two estimates of net annual change in groundwater storage. One estimate equals the difference between total inflows and total outflows, and the other is a volumetric calculation based on aquifer storativity values and changes in observed groundwater elevations. Comparison of the two change-in-storage values allows consideration of the accuracy of the overall water balance estimate.

Future water balances, including the water balances required by SGMA, will be assessed according to those DWR GSP regulations and Best Management Practices. The water balances also will be computed according to DWR groundwater basin definitions. In addition, an updated hydrogeologic conceptual model and improved numerical model will provide comprehensive simulations of historical, current, and sustainable conditions. Comparison of simulated conditions to historical conditions and estimated water balances (in terms of differences between simulated and observed groundwater elevations and flows) will allow identification of data gaps and uncertainties and systematic review and adjustment of water balance analyses.

Inflows

There are six major sources of inflow to the subbasins in Zone 6 and surrounding areas. These include natural stream percolation, percolation from Hernandez/Paicines releases, direct percolation of imported CVP water, deep percolation (from rainfall and/or irrigation), percolation of reclaimed water, and subsurface groundwater inflow.

Stream Percolation. Percolation along local stream channels provides groundwater recharge in many parts of the basin. Percolation can occur from natural flows, or releases from Hernandez Reservoir in the headwaters of the San Benito River watershed. The three-year period 2015-2017 includes a dry, average, and wet year. Infiltration amounts from reservoir releases were 0 AF in 2015 (a dry year) and substantially increased in the wet year 2017, when releases from Hernandez Reservoir were 23,191 AF and releases from Paicines were 2,407 AF.

Percolation is estimated based on the amount of natural flow in the waterway, the distance that the waterway transverses a subbasin, and the channel percolation capacity. Percolation capacities were estimated from synoptic surveys of changes in flow along each creek completed in the late 1990's (Yates, 2008). The overall percolation capacity and the length of the "losing" reach both decrease when groundwater elevations are high. Because the percolation estimates are based on static values for these variables, there is some uncertainty in the amount of stream flow that percolates in any given year. Flow and percolation rates for local creeks and the San Benito River are shown in **Table G-1**.

Table G-1. Estimated parameters for stream percolation

Name	Watershed Area (ac)	Annual Precipitation (in)	Calibration+	Subbasin	Length of Percolation (mi)	Maximum Percolation Rate (cfs/mi)
Pacheco Creek	145.0	18	1	Pacheco	2	5.34
Arroyo de las Viboras	22.1	22	1	Pacheco	2.28	6.29
Arroyo Dos Picachos	16.2	20	1	Hollister East	1.31	1.02
Santa Ana Creek	36.5	19	1	Hollister East	7.58	6
Bird Creek*+	15.0	18	0.15	Hollister West Tres Pinos	--	--
Pescadero Creek*+	38.3	18	0.15	Hollister West Tres Pinos	--	--
Tres Pinos Creek*	--	--	1	Tres Pinos	--	--
San Benito River*	--	--	1	San Juan, Hollister West, Tres Pinos	--	--

*Percolation along these streams is calculated using a combination of USGS gage data and Hernandez/Paicines release information

+Pescadero and Bird Creek flows were reduced by a calibration factor to remain consistent with observed flows

Stream flow gages are only present on Pacheco Creek, Tres Pinos Creek and the San Benito River. Daily flows in ungaged streams are estimated from gaged flows in three reference streams outside the basin (previous water balances used four reference gages but Gabilan Creek is no longer routinely monitored). These streams are listed in **Table G-2**. This regional approach avoids potential errors associated with anomalous rainfall or stream flow conditions at any single reference gage. For each of the local ungaged streams, a daily unit flow was determined by normalizing stream flow by watershed area and annual average precipitation. The unit flows of the four streams were averaged to determine a reference unit flow per day that could be applied to streams within the basin. The unit flow was multiplied by each stream's watershed area and annual average precipitation, **Table G-1**, to develop a daily estimate of flow. The maximum portion of estimated daily flow that could result in recharge was determined by multiplying the length of the percolation reach in the subbasin by the maximum percolation rate in cfs per mile.

Table G-2. Reference streams used to estimate daily flow on ungaged streams.

Name	Watershed Area (ac)	Annual Precip (in)	USGS Station ID	Location	Latitude	Longitude
Gabilan Creek (no longer monitored)	36.7	18	11152600	Salinas, CA	36.755792	-121.610501
Cantua Creek	46.4	11	11253310	San Joaquin Valley	36.402174	-120.43349
Los Gatos Creek	95.8	16	11224500	Coalinga, CA	36.2146772	-120.470712
Corralitos Creek	27.8	35	11159200	Watsonville, CA	36.9393968	-121.770507

Percolation on the San Benito River can be estimated using two available USGS gages and available percolation rate data from synoptic surveys. However, flow in the river at these gages consists of a combination of natural sources and reservoir releases. In order to estimate the contribution of each source to the stream flow percolation, a more detailed analysis has been required as described in the Reservoir Releases section below.

Because of changing conditions, high groundwater elevations, antecedent moisture conditions, and intensity of precipitation, the percolation rate, volume, and the portion of the stream recharging groundwater also change over time. Because the simple method developed to estimate percolation is based on one set of percolation data (length and rate) and assumes available groundwater storage, it represents a maximum amount of percolation.

Reservoir Releases. San Benito River and Tres Pinos Creek flows are augmented by releases from the upstream Hernandez and Paicines Reservoirs. The flow from natural sources (e.g., rainfall) and from reservoir releases were estimated separately to determine the contribution of flow and percolation by source. For the San Benito River, the USGS has continuous gages at two locations: Willow Creek School (upstream of Paicines Valley) and Old Highway 156 (near Hollister). Because reservoir releases from Hernandez and flow at Willow Creek School are both observed, the contribution of the releases to the total flow can be determined by assuming any flow up to the volume of the release is from a reservoir release. The remaining flow can be considered the natural flow component. This simple analysis sometimes leads to a more variable natural flow than expected under the current conceptual model. In previous water balances (water year 2008 and earlier) a regression was used to smooth the streamflow data and reduce variability. However, for this 2017 report was determined on an annual scale that this approach adequately estimates the natural percolation and reservoir release percolation.

Percolation from the San Benito River occurs along the four subbasins it traverses: Paicines Valley, Tres Pinos, Hollister West, and San Juan. The first three of those are between the two USGS gages, and the overall flow loss between the gages is apportioned among the subbasins based on groundwater conditions, accounting for additional flow from Pescadero and Bird Creeks (estimated by the reference stream method discussed above).

Percolation capacity is assumed to be satisfied first by reservoir release flows, because the releases are managed to percolate entirely before leaving the inter-gage reach. The remainder of flow and percolation is assumed to be from natural sources. Flow past the Highway 156 gage is assumed all flow percolates based on observations by District staff.

The portion of percolation that occurs in Paicines Valley is determined through a water budget that estimates groundwater storage depletion during the preceding dry season. River percolation reliably refills the deficit in all but very dry years. The remaining percolation upstream of the Highway 156 gage is apportioned between the Tres Pinos and Hollister West subbasins based on their respective reach lengths and flow and groundwater conditions. The drought that commenced in 2013 resulted in decreased CVP imports, increased groundwater pumping, lower groundwater elevations and very low local stream flow. Accordingly, percolation was not reduced by rejected recharge (as was the case in the early 2000s). Proceeding in downstream order, each subbasin was assumed to percolate up to the amount of available flow or the channel percolation capacity, whichever was smaller.

Percolation releases from Paicines Reservoir were assumed to completely infiltrate along Tres Pinos Creek in the Tres Pinos subbasin. Finally, flow in the San Benito River occasionally reached the gage at old Highway 156, even though the annualized percolation calculations indicated that all river water should have percolated upstream of the gage. The discrepancy results from transient events when flashy river flows temporarily exceed the percolation capacity, and possibly also errors in estimated percolation capacity. However, in 2017 it was assumed all releases percolated before leaving the basin.

CVP Percolation. From 1992 to 2005, the District released CVP water to local creek channels for percolation. That practice was discontinued because of the full condition of the basin at the time and the potential for release of invasive mussels from the imported water system. In 2017, the District used two off-stream recharge basins to percolate CVP imports. The Union Road basin in Hollister West percolated 2,209 AF beginning in March 2017, while another pond in Pacheco subbasin was used to percolate 340 AF April through September.

Deep Percolation. Deep percolation refers to the portion of water applied to the basin (either through precipitation or irrigation) that percolates through the soil to the groundwater aquifer. A soil moisture budget was prepared to examine the portion of the daily volume of precipitation and irrigation that percolates to the aquifer. A soil moisture budget accounts for several factors including daily precipitation, interception, runoff, infiltration, soil moisture storage, evapotranspiration, and the amount and efficiency of applied irrigation water. The basic concept of a soil moisture budget is that deep percolation is expected to occur only when the maximum moisture-holding capacity of the soil is reached. The budget calculations update soil moisture storage and deep percolation on a daily time step for each recharge zone.

Recharge zones were assigned to one of 22 land use categories, which included six categories of natural vegetation, seven categories of urban or developed uses, and seven categories of irrigated crops. The crop categories reflected groups sharing similar root depths, crop coefficients and growing seasons: pasture, grain, field crops, truck crops (vegetables), deciduous orchard, citrus, and vineyard.

The daily soil moisture capacity can be expressed as:

Soil Moisture Storage = Precipitation– Interception - Runoff –ET demands + Irrigation + Previous Day's Soil Moisture Storage

If the calculated soil moisture storage is greater than the maximum, then deep percolation occurs:

Deep Percolation = Soil Moisture Storage – Maximum Soil Moisture Capacity

Deep percolation accrues to a shallow groundwater storage zone from which groundwater leaks downward to the regional aquifer system at a constant rate or seeps laterally into a creek channel at a rate proportional to shallow groundwater storage. Each of the variables and how they were estimated are discussed below:

Precipitation – Daily rainfall (in inches) was obtained from the National Climatic Data Center precipitation station "Hollister 2".

Interception— Interception is rain that adheres to leaves and never reaches the ground. It was assumed to range from 0 inches for unvegetated areas to 0.02 inches for deciduous vegetation to as much as 0.08 inches for perennial broad-leaf shrubs and trees. Interception was subtracted from rainfall on each rainy day.

Runoff – The amount of rainfall that results in runoff was estimated using a linear equation. Runoff was assumed to commence when daily rainfall exceeded a threshold amount. This threshold was estimated to range from 0.3 inches for urban industrial zones to 1.1 inches for all categories of cropland and natural vegetation on level ground. Above the threshold, 90-96 percent of daily rainfall was assumed to infiltrate, while the remainder became direct runoff, depending on land use category. These values were based on model calibration studies in another central coast groundwater basin (HydroFocus, 2012).

Evapotranspiration (ET)– Evapotranspiration refers to the evaporation of water from soil (evaporation) and leaves (transpiration). It was calculated using the common method of multiplying a reference value of ET by a crop coefficient that reflects differences in physical characteristics between the type of vegetation in a recharge zone and the reference conditions. Measured daily reference evapotranspiration (ETo) was downloaded from the California Irrigation Management Information System (CIMIS) for the San Benito station located at the District's offices on the eastern outskirts of Hollister (Station # 126).

Monthly ET crop coefficients (Kc) for each crop type were adapted from several sources (California Department of Water Resources, 1975; Snyder and others, 2007; Williams, 2001; U.N. Food and Agriculture Organization) and are shown in **Table G-3** (located at the end of the section). Note that each recharge zone was assumed to comprise impervious, irrigated and non-irrigated land cover, with the corresponding percentages reflecting the primary land use (residential, industrial, natural, cropland).

Irrigation – For irrigated areas, irrigation demand is estimated based on the accumulated soil moisture deficit since the last rainfall or irrigation event. Irrigation is triggered on the day when soil moisture drops below a threshold, which was set to 80 percent of soil moisture capacity for most crops. The amount of irrigation water applied was calculated as the accumulated soil moisture deficit (in inches) divided by the irrigation efficiency. Irrigation efficiency was assumed to be 85 percent for all commercial crops except vineyards. The over-applied water (15 percent of the application in this case) causes the soil moisture profile to over-fill, and the excess becomes deep percolation. Inefficiency due to evaporation of sprinkler spray, overspray onto impervious surfaces, or runoff is not considered.

Vineyards are drip irrigated and typically grown under a "regulated deficit irrigation" (RDI) regimen during mid-July through harvest. RDI deliberately under-irrigates the vines and imposes mild water stress. Drip irrigation was assumed to be 95 percent efficient outside the RDI season and 100 percent efficient during the season.

Soil Moisture Capacity - The maximum soil moisture capacity is the total amount of water that can be stored in the root zone of a specific soil with a given land cover. Any additional water introduced into the root zone results in deep percolation to the shallow groundwater zone. Maximum soil moisture capacity is derived from the available capacity of a soil (the moisture range between field capacity and permanent wilting point, in inches per inch) and the rooting depth of the land cover/crop. The rooting depths were compiled from a variety of sources including Blaney and others (1963) for native vegetation, United Nations FAO Irrigation and Drainage Paper No. 56 for crops (2006), and Dunne and Leopold (1978) for bare soils. The available water capacity was based on the Natural Resources

Conservation Service soil survey. The soil moisture budget simulation is continuous, so the ending soil moisture for one year becomes the initial soil moisture balance for the following year. Parameters for the shallow groundwater zone were set to allow all deep percolation from the root zone to become regional groundwater recharge, with no seepage into local stream channels. Accretions to small stream base flow typically occur only when peripheral watershed areas are being simulated.

The soil moisture budget accounting comingles rainfall infiltration and applied irrigation water. For the purposes of the annual report, deep percolation from natural and irrigation sources are reported separately in the water balance tables. The irrigation component is calculated as:

Irrigation deep percolation = Applied irrigation water * (1 – irrigation efficiency)

The natural component equals the remainder of the total deep percolation.

Paicines and Tres Pinos Creek Valleys are outside the area covered by the current groundwater model and were not included in the simulated recharge zones. Irrigation demand and groundwater recharge for those areas were estimated from simulation results for a mix of zones with similar crops within Zone 6.

Reclaimed Water Percolation. Several municipalities have wastewater treatment plants (WWTPs) within the basin, including the Tres Pinos, Cielo Vista, and San Juan Bautista WWTPs, one active sites operated by Sunnyslope County Water District near Ridgemark, and the City of Hollister domestic and industrial plants (DWTP and IWTP, respectively). Tres Pinos, SSCWD and the City of Hollister have percolation ponds where treated wastewater is percolated to the groundwater aquifer. The total volume percolated is reported by facility in **Appendix D** for water years 2015 through 2017. The percolation from each facility is assigned to one or more subbasins. The distribution of reclaimed water percolation is shown in **Table G-4**. The proportions of IWTP recharge percolating into the San Juan and Hollister West subbasins are estimated and can change over time.

Table G-4. Percent of WW percolating in each subbasin

	San Juan	Hollister West	Tres Pinos
Hollister -- domestic	100		
Hollister -- industrial	50	50	
Ridgemark Estates I & II			100
Tres Pinos			100

Subsurface Inflow. Subsurface groundwater flow to and from individual subbasins was calculated for 2015-2017 using Darcy's Law. The Darcy's Law estimates for 2015-2017 were derived from the slopes on groundwater contour maps and the flux calculated based on estimated hydraulic conductivity. In prior years, minor adjustments to groundwater inflows and outflows were made if they were consistent with general changes in groundwater elevations and reduced the discrepancies between the two estimates of storage change for the subbasin.

Table G-4. Inflows and Outflows Based on Darcy's Flow Equation

	2015 Totals (AF)		2016 Totals (AF)		2017 Totals (AF)	
	Inflow	Outflow	Inflow	Outflow	Inflow	Outflow
Pacheco	2,647	1,913	2,841	2,578	3,081	1,667
Bolsa South East	5,398	3,485	4,142	1,909	4,317	1,465
San Juan	49	11	109	14	74	16
Hollister West	4,288	5,398	6,908	4,142	6,775	4,317
Hollister East	4,101	2,080	3,985	2,338	3,663	2,595
Tres Pinos	2,310	1,379	2,859	1,877	2,610	2,332
Bolsa	6,866	0	8,055	0	5,916	0
Paicines	0	500	0	500	0	500
Tres Pinos Creek Valley	--	2,310	--	2,859	--	2,610
Total	9,176	1,379	10,914	1,877	8,526	2,332

Outflows

The major outflows from the subbasins in Zone 6 and surrounding areas are groundwater pumping (agricultural and M&I plus domestic) and surface and subsurface outflow.

Pumping. Groundwater pumping in Zone 6 is metered by means of hour meters on irrigation wells that are read three times per water year in early spring, summer, and early fall. Groundwater meters are categorized as agriculture use, domestic use, or municipal use. Monthly data for municipal wells are also received directly from the City of Hollister, SSCWD, City of San Juan Bautista, and Tres Pinos Water District. For areas outside of Zone 6 (Bolsa, Pacheco Valley, Tres Pinos Creek Valley, and Paicines), agricultural pumping is estimated using the soil moisture budget. The irrigation needs of the subbasins are based on land use, crop evapotranspiration coefficient, and irrigation efficiency. Domestic and municipal use in the Bolsa and Pacheco subbasins are assumed negligible.

Agricultural pumping is also calculated using the soil moisture balance described in the inflow section. The calculated pumping (estimated groundwater needed to meet the applied water demand of the specific crops) is significantly different than the reported pumping. It is unclear why this discrepancy

exists and it is recommended the District is investigating the accuracy of their meters. For purposes of this annual report, the reported groundwater use was used to remain consistent with previous years.

Groundwater Outflow. Subsurface outflow is determined by the same method as groundwater inflow. The Darcy's Law estimates for 2015-2017 were derived from the slopes on groundwater contour maps and the flux calculated based on estimated hydraulic conductivity.

Change in Storage

The change in groundwater storage can be estimated two ways. The first is simply:

Inflows- Outflows = Change in Storage

The second method, described in detail in the groundwater elevations section of the report, involves analysis of the change in groundwater elevations and the regional storativity values.

Conclusion

The water balance analysis provides independent estimation of each element with consistent methodology, and thereby provides a useful check on the current basin conceptualization. The water balance can be used to help illustrate and document changes in groundwater basin conditions, and can indicate changes in groundwater use, hydrologic conditions, or groundwater management. Consistent with SGMA requirements, the water balance will be analyzed for historical, current, and future conditions in the GSP and then updated and reported annually. As part of GSP preparation, development of an updated hydrogeologic conceptual model, improved numerical model, and expanded monitoring program will support more accurate and reliable water balance analyses. The forthcoming water balances also will address the full extent of the DWR-defined Bolsa, Hollister, and San Juan Bautista groundwater basins.

Table G-5. Water Balance for Water Year 2006 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow*	1,659	0	1,410	1,134	2,681	378	7,263	500	238	2,521	10,522
Reservoir releases	0	0	587	1,222	0	407	2,217	0	0	0	2,217
CVP Percolation	0	0	0	451	0	1	452	0	0	0	452
Deep percolation through soils											
Rainfall+	1,763	699	5,499	1,396	2,859	842	13,059	3,853	451	110	17,472
Irrigation	447	252	1,262	194	953	100	3,207	623	102	32	3,964
Reclaimed water percolation	0	0	2,402	606	0	249	3,257	0	0	0	3,257
Groundwater inflow	4,000	3,750	500	2,750	1,250	4,000	16,250	6,000	500	500	23,250
Total	7,869	4,700	11,660	7,753	7,743	5,978	45,704	10,976	1,290	3,162	61,133
Outflows											
Wells											
Agricultural	1,029	1,856	5,822	1,422	1,263	842	12,234	6,234	1,016	316	19,800
Domestic and M & I	180	8	919	3,211	1,292	1,645	7,255	0	0	49	7,304
Groundwater outflow	4,250	2,000	2,000	3,750	1,500	2,750	16,250	5,250	500	500	22,500
Total	5,458	3,864	8,741	8,383	4,055	5,238	35,739	11,484	1,516	865	49,603
Storage change											
Inflows - outflows	2,411	837	2,919	(630)	3,688	741	9,965	(508)	(225)	2,298	11,530
Water level change	410	245	442	770	1,539	409	3,815	1,195	0	0	5,010

*rejected recharge was assumed to be 50 % for Pacheco, natural percolation in San Juan subbasin was also decreased by 50 percent to represent rejected recharge
+Deep percolation from rainfall was decreased by 20 percent to account for additional runoff and rejected recharge during wet times

Table G-6. Water Balance for Water Year 2007 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow*	799	0	25	73	319	24	1,241	500	34	2,673	4,448
Reservoir releases	0	0	767	2,297	0	766	3,830	0	0	0	3,830
CVP Percolation	0	0	0	216	0	88	304	0	0	0	304
Deep percolation through soils											
Rainfall	378	179	1,166	287	402	66	2,478	759	96	17	3,350
Irrigation	457	257	1,218	214	1,069	95	3,311	709	116	35	4,170
Reclaimed water percolation	0	0	2,354	614	0	158	3,126	0	0	0	3,126
Groundwater inflow	4,500	3,000	250	3,000	1,250	3,000	15,000	6,000	500	500	22,000
Total	6,135	3,436	5,781	6,701	3,040	4,197	29,290	7,968	746	3,224	41,228
Outflows											
Wells											
Agricultural	810	1,998	6,562	1,662	2,366	849	14,247	7,086	1,156	350	22,839
Domestic and M & I	224	7	1,096	3,456	1,501	2,013	8,297	0	0	46	8,343
Groundwater outflow	4,250	2,000	500	2,750	1,500	1,250	12,250	1,500	500	500	14,750
Total	5,284	4,005	8,158	7,868	5,367	4,112	34,794	8,586	1,656	896	45,932
Storage change											
Inflows - outflows	851	(569)	(2,377)	(1,168)	(2,327)	85	(5,504)	(618)	(910)	2,328	(4,703)
Water level change	(958)	(1,466)	(2,530)	(400)	(2,909)	(220)	(8,482)	(862)	0	0	(9,344)

*no rejected recharge removed

Table G-7. Water Balance for Water Year 2008 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow*	1,131	0	496	275	726	92	2,719	500	146	2,669	6,035
Reservoir releases	0	0	412	564	0	188	1,164	0	0	0	1,164
CVP Percolation	0	0	0	6	0	0	6	0	0	0	6
Deep percolation through soils											
Rainfall	1,111	556	4,414	898	2,150	594	9,723	2,928	224	41	12,916
Irrigation	322	233	958	151	801	66	2,531	789	126	37	3,483
Reclaimed water percolation	0	0	2,209	629	0	158	2,996	0	0	0	2,996
Groundwater inflow	4,750	4,000	250	3,000	1,000	3,500	16,500	7,000	500	500	24,500
Total	7,314	4,790	8,739	5,522	4,678	4,597	35,639	11,217	996	3,247	51,099
Outflows											
Wells											
Agricultural	1,703	2,001	6,744	1,143	2,639	567	14,796	7,889	1,255	372	24,313
Domestic and M & I	197	13	1,053	3,232	1,323	2,130	7,947	0	0	47	7,993
Groundwater outflow	5,500	1,250	250	3,500	1,500	2,500	14,500	1,250	500	500	16,750
Total	7,400	3,264	8,046	7,875	5,462	5,197	37,243	9,139	1,755	919	49,056
Storage change											
Inflows - outflows	(85)	1,525	693	(2,353)	(784)	(600)	(1,604)	2,078	(759)	2,328	2,043
Water level change	(298)	2,483	174	1,009	(403)	(158)	2,807	1,796	0	0	4,603

*no rejected recharge removed

Table G-8. Water Balance for Water Year 2009 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow	771	0	666	1,517	449	506	3,910	500	0	413	4,823
Reservoir releases	0	0	1,013	2,318	0	773	4,104	0	0	0	4,104
CVP Percolation	0	0	0	0	0	0	0	0	0	0	0
Deep percolation through soils											
Rainfall	767	424	2,515	676	748	185	5,314	1,185	182	31	6,712
Irrigation	494	185	910	340	577	111	2,618	721	114	34	3,488
Reclaimed water percolation	0	0	2,190	214	0	191	2,594	0	0	0	2,594
Groundwater inflow	3,422	1,500	260	2,032	1,000	1,644	9,858	4,000	0	--	13,858
Total	5,454	2,109	7,554	7,098	2,774	3,409	28,398	6,407	296	478	35,579
Outflows											
Wells											
Agricultural	3,106	2,073	10,943	1,495	3,535	600	21,753	7,213	1,140	344	30,451
Domestic and M & I	264	9	1,013	2,691	1,198	2,271	7,446	0	0	0	7,446
Groundwater outflow	2,000	1,000	19	1,500	2,159	2,000	8,678	0	0	1,644	10,322
Total	5,370	3,082	11,975	5,686	6,892	4,871	37,877	7,213	1,140	1,988	48,218
Storage change											
Inflows - outflows	84	(974)	(4,421)	1,412	(4,118)	(1,462)	(9,478)	(807)	(845)	(1,510)	(12,639)
Water level change	1,639	(5,338)	(437)	(431)	4,710	1,913	2,055	(3,372)	(343)	(366)	(2,026)

Adjustments

Adjusted Bolsa SE/Hollister West subsurface flow
Adjusted Bolsa/Pacheco subsurface flow
Adjusted Bolsa/Bolsa SE subsurface flow
Assumed all San Benito River flows percolate within the basin

Table G-9. Water Balance for Water Year 2010 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow	671	0	701	993	467	331	3,164	500	0	(316)	3,348
Reservoir releases	0	0	829	1,755	0	585	3,169	0	0	0	3,169
CVP Percolation	0	0	0	0	0	0	0	0	0	0	0
Deep percolation through soils											
Rainfall	806	407	2,611	749	717	152	5,444	1,403	231	43	7,121
Irrigation	433	150	766	301	472	88	2,210	629	103	33	2,975
Reclaimed water percolation	0	0	1,940	18	0	191	2,150	0	0	0	2,150
Groundwater inflow	2,870	2,874	36	2,021	1,041	1,901	10,742	6,600	0	--	17,341
Total	4,780	3,431	6,883	5,837	2,698	3,248	26,877	9,132	334	(240)	36,103
Outflows											
Wells											
Agricultural	2,517	1,896	8,745	1,614	3,739	575	19,087	6,294	1,032	326	26,740
Domestic and M & I	36	0	816	2,467	721	1,111	5,152	0	0	0	5,152
Groundwater outflow	3,108	1,473	19	2,874	1,619	2,000	11,093	0	0	1,901	12,994
Total	5,661	3,370	9,580	6,955	6,079	3,686	35,332	6,294	1,032	2,227	44,885
Storage change											
Inflows - outflows	(881)	61	(2,697)	(1,118)	(3,382)	(438)	(8,455)	2,838	(698)	(2,467)	(8,782)
Water level change	(1,335)	5,443	(811)	(477)	(2,032)	(2,485)	(1,696)	4,631	(2,036)	(1,067)	(168)

Adjustments

- Bolsa SE not adjusted due to uncertainty in the observed groundwater levels
- Reduced Pacheco and Hollister East stream flow to 25 % of calculated
- Reduced subsurface outflow from Pacheco
- Reduced subsurface inflow from Pacheco outside basin
- Reduced subsurface inflow into Tres Pinos
- Assumed 50% of San Benito River flows out of the basin

Table G-10. Water Balance for Water Year 2011 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow	896	0	2,272	1,948	693	812	6,622	500	1,304	3,003	11,428
Reservoir releases	0	0	846	764	0	318	1,929	0	511	0	2,440
CVP Percolation	0	0	0	0	0	0	0	0	0	0	0
Deep percolation through soils											
Rainfall	1,627	475	3,034	1,383	1,230	348	8,097	1,919	452	120	10,588
Irrigation	435	150	767	301	446	88	2,187	577	101	32	2,898
Reclaimed water percolation	0	0	2,040	233	0	202	2,475	0	0	0	2,475
Groundwater inflow	3,037	3,055	100	2,019	900	2,003	11,115	6,676	0	--	17,791
Total	5,995	3,680	9,059	6,648	3,269	3,772	32,424	9,672	2,369	3,155	47,620
Outflows											
Wells											
Agricultural	1,910	2,775	4,664	1,801	1,247	390	12,786	5,775	1,013	322	19,896
Domestic and M & I	82	6	322	2,139	700	2,064	5,315	0	0	0	5,315
Groundwater outflow	3,191	1,500	3,600	3,055	2,000	2,000	15,346	0	0	2,003	17,349
Total	5,183	4,281	8,587	6,995	3,947	4,454	33,447	5,775	1,013	2,325	42,560
Storage change											
Inflows - outflows	812	(601)	473	(347)	(678)	(682)	(1,023)	3,897	1,356	830	5,060
Water level change	389	(2,508)	(523)	(198)	570	228	(2,042)	(2,239)	852	2,334	(1,095)

Adjustments

Reduced Pacheco stream flow to 25% of calculated
Assumed 58% of San Benito River flows out of the basin
Reduced deep peroclation in San Juan and parts of Bolsa
Adjusted Holliseter West/Tres Pinos interaction
Reduced subsurface inflow from Pacheco outside basin and Holliser East
Increased groundwater outflow from San Juan

Table G-11. Water Balance for Water Year 2012 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow	564	0	42	0	261	0	867	0	24	429	1,320
Reservoir releases	0	0	0	0	0	1,321	1,321	0	122	0	1,443
CVP Percolation	0	0	0	0	0	0	0	0	0	0	0
Deep percolation through soils											
Rainfall	3,560	944	4,804	1,779	4,752	1,013	16,852	6,529	799	129	24,309
Irrigation	1,096	364	1,687	492	2,049	278	5,964	1,928	107	43	8,043
Reclaimed water percolation	0	0	2,043	303	0	196	2,541	0	0	0	2,475
Groundwater inflow	3,109	2,476	132	2,024	980	1,849	10,571	6,676	0	--	17,791
Total	8,257	4,363	8,673	4,522	7,962	4,817	38,594	15,133	1,053	601	55,381
Outflows											
Wells											
Agricultural	5,303	1,546	5,205	2,589	5,217	1,590	21,450	14,869	1,072	432	35,800
Domestic and M & I	158	4	528	2,568	624	2,233	6,115	0	0	0	6,142
Groundwater outflow	2,766	1,324	1,213	2,476	1,926	2,000	11,705	0	0	2,003	17,349
Total	8,661	3,052	9,335	8,216	7,851	5,823	42,937	12,847	1,072	2,435	59,291
Storage change											
Inflows - outflows	(404)	1,311	(662)	(3,693)	112	(1,005)	(4,343)	2,285	(19)	(1,834)	(3,911)
Water level change	(882)	53	0	640	(1,096)	601	(683)	2,144	0	0	1,461

Adjustments

Agricultural pumping is based on reported groundwater use

Table G-12. Water Balance for Water Year 2013 (AFY)

	Pacheco	Bolsa Southeast	San Juan	Hollister West	Hollister East	Tres Pinos	Zone 6 Subtotal	Bolsa	Paicines	Tres Pinos Creek Valley	Grand Total
Inflows											
Stream percolation											
Natural streamflow	340	0	214	0	163	0	716	0	69	246	1,031
Reservoir releases	0	0	0	0	0	677	677	0	151	0	828
CVP Percolation	0	0	0	0	0	0	0	0	0	0	0
Deep percolation through soils											
Rainfall	1,036	248	1,530	549	1,210	313	4,886	1,891	293	24	7,094
Irrigation	1,134	375	1,681	515	1,970	312	5,987	2,231	140	64	8,422
Reclaimed water percolation	0	0	1,055	166	0	209	1,430	0	0	0	2,475
Groundwater inflow	3,109	2,476	132	2,024	980	1,849	10,571	6,676	0	--	17,791
Total	5,547	3,678	5,565	3,316	4,243	3,507	25,856	10,798	654	334	37,641
Outflows											
Wells											
Agricultural	4,056	2,344	10,497	2,999	4,420	580	24,896	14,869	1,404	639	42,728
Domestic and M & I	101	4	548	2,656	1,009	1,872	6,190	0	0	0	6,191
Groundwater outflow	2,766	1,324	1,213	2,476	1,926	2,000	11,705	0	0	2,003	17,349
Total	9,421	3,176	13,294	6,983	8,832	5,648	47,353	14,869	1,404	2,642	66,267
Storage change											
Inflows - outflows	(3,873)	502	(7,729)	(3,667)	(4,589)	(2,141)	(21,497)	(4,071)	(750)	(2,309)	(28,627)
Water level change	(597)	(918)	(6,239)	(1,730)	351	(586)	(9,718)	(674)	0	0	(10,392)

Adjustments

Agricultural pumping is based on reported groundwater use

H SGMA SUPPORT

List of Documents

- Resolution No. 2017-03
- MOU with SCVWD

RESOLUTION NO. 2017-03

A RESOLUTION OF THE BOARD OF DIRECTORS SAN BENITO COUNTY WATER DISTRICT'S DECISION TO BECOME THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE BOLSA, HOLLISTER, AND SAN JUAN SUBBASINS WITHIN SAN BENITO COUNTY

WHEREAS, on September 16, 2014, the Sustainable Groundwater Management Act (SGMA) was signed into law and adopted into the California Water Code, commencing with Section 10720; and

WHEREAS, the legislative intent of SGMA is to provide for the sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management; and to provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, Water Code Sections 10725 et al. and 10726 et al. detail additional new powers and authorities granted to Groundwater Sustainability Agencies to implement sustainable groundwater management in the basins under their jurisdictions; and

WHEREAS, the San Benito County Water District Act (California Water Code Appendix, Chapter 70) provides the District with broad groundwater management authority, including the authority to conserve water for beneficial and useful purposes by spreading, storing, retaining, and causing such waters to percolate into the soil within or without the District; and

WHEREAS, the District's statutory boundary overlies the Bolsa, Hollister, and San Juan Subbasins within San Benito County; and

WHEREAS, the Bolsa, Hollister, and San Juan Subbasins are deemed by the California Department of Water Resources (DWR) to be medium-priority basins and therefore require the development of a Groundwater Sustainability Plan; and

WHEREAS, establishing the District as the Groundwater Sustainability Agency will enable the District to prepare and implement a Groundwater Sustainability Plan (GSP) for the Bolsa, Hollister, and San Juan Subbasins within San Benito County, and to best work with DWR and the State Water Resources Control Board to resolve groundwater and surface water issues related to the Bolsa, Hollister, and San Juan Subbasins within San Benito County; and

WHEREAS, the District is committed to its legislatively created mandate to manage the surface water and groundwater resources within its jurisdiction; and

WHEREAS, prior to adopting a resolution of intent to establish the District as a Groundwater Sustainability Agency, Water Code Section 10723 requires the local agency to hold a public hearing, after publication of notice pursuant to California Government Code Section 6066, on whether or not to adopt a resolution to establish a Groundwater Sustainability Agency; and

WHEREAS, pursuant to Government Code 6066, notices of a public hearing on whether or not to adopt a resolution to establish a Groundwater Sustainability Agency were published on January 27, 2017 and February 3, 2017; and

WHEREAS, on February 8, 2017, this District held a public hearing regarding the adoption of a resolution to establish the District as the Groundwater Sustainability Agency for the Bolsa, Hollister, and San Juan Subbasins within San Benito County;

NOW, THEREFORE BE IT RESOLVED that the Board of Directors of the San Benito County Water District:

1. Hereby establishes the District as the Groundwater Sustainability Agency for the Bolsa, Hollister, and San Juan Subbasins within San Benito County; and

2. Hereby authorizes the District Manager or his designee to provide a copy of this resolution and a Notice of Intent to the California Department of Water Resources within 30 days and to otherwise comply with the requirements of Water Code Section 10723.B(a); and

3. All the recitals in this Resolution are true and correct and the District so finds, determines, and represents.

PASSED AND ADOPTED at a Special Meeting of the Board of Directors of San Benito County Water District by the following vote on February 8, 2017:

AYES: Tobias, Tonascia, Bettencourt, Flores & Huenemann
NOES: None
ABSENT: None
ABSTAIN: None

John Tobias
President

ATTEST:

Sara Singleton
Assistant Manager

DOCUMENT #

MOU 00150

MEMORANDUM OF UNDERSTANDING BETWEEN SANTA CLARA VALLEY WATER DISTRICT AND SAN BENITO COUNTY WATER DISTRICT FOR SUSTAINABLE GROUNDWATER MANAGEMENT ACT COMPLIANCE

THIS MEMORANDUM OF UNDERSTANDING ("MOU"), made in the State of California on July 5, 2017, is by and between the Santa Clara Valley Water District ("SCVWD"), and the San Benito County Water District ("SBCWD"), each a "Party" and collectively the "Parties."

This MOU sets forth the respective roles and responsibilities of the Parties regarding coordination to sustainably manage groundwater in the Hollister Area Subbasin and San Juan Bautista Area Subbasin.

RECITALS

WHEREAS, the SCVWD, an independent special district created by the Legislature of the State of California, manages groundwater and is the primary water resource agency for Santa Clara County, supplying wholesale water, providing flood protection and serving as environmental steward for clean, safe creeks and healthy ecosystems; and

WHEREAS, the SBCWD, a water conservation and flood control district, preserves the economic and environmental health and well-being of San Benito County through the control, management and conservation of waters and the provision of water services in a practical, cost-effective and responsible manner; and

WHEREAS, the Sustainable Groundwater Management Act ("Act"), enacted by the State of California, provides that local agencies may become a Groundwater Sustainability Agency ("GSA") and adopt a Groundwater Sustainability Plan ("GSP") to manage groundwater basins within the local agency's statutory jurisdiction; and

WHEREAS, the Act and this MOU define "basin" as a basin or subbasin identified and defined in California Department of Water Resources (DWR) Bulletin 118; and

WHEREAS, the Act requires that the entirety of each medium- and high-priority basin, as defined by DWR, be covered by a GSA by June 30, 2017 to avoid potential state intervention; and

WHEREAS, the service area of each Party overlies two common groundwater basins as defined by the Act and DWR: the Hollister Area Subbasin (DWR Basin 3-3.03) and the San Juan Bautista Area Subbasin (DWR Basin 3-3.04), collectively the "Common Basins"; and

WHEREAS, the SBCWD manages groundwater within San Benito County, including the majority of the Common Basins and the entirety of the Bolsa Area Subbasin (DWR Basin 3-3.02); and

WHEREAS, small portions of the Common Basins are located within Santa Clara County; and

WHEREAS, in terms of surface area, Santa Clara County contains less than ten percent of the Hollister Area Subbasin and less than one percent of the San Juan Bautista Area Subbasin; and

WHEREAS, the SCVWD has not previously conducted groundwater management activities in the Santa Clara County portions of the Common Basins other than permitting the construction, modification, and destruction of wells; and

WHEREAS, following a public hearing on February 8, 2017, the SBCWD Board of Directors adopted Resolution 2017-03 establishing the SBCWD as the GSA for the portions of the Common Basins located within San Benito County; and

WHEREAS, following a public hearing on June 13, 2017, the SCVWD Board of Directors adopted Resolution 17-38 establishing the SCVWD as the GSA for the portion of the Common Basins in Santa Clara County; and

WHEREAS, the action of each Party to adopt a resolution to become the GSA and submit related notification to DWR ensures the entirety of the Common Basins is covered by a GSA with no areas of overlap; and

WHEREAS, each Party is a local agency qualified to prepare and adopt a GSP under the Act; and

WHEREAS, the entirety of each basin subject to the Act that is not in a condition of critical overdraft must be addressed by a GSP by January 31, 2022; and

WHEREAS, if there are multiple GSAs within a basin, the GSAs can develop a single GSP for the entire basin or separate GSPs, provided there is a related coordination agreement; and

WHEREAS, for the purposes of this MOU, "GSP" is defined as one or more GSPs developed by the Parties for the entirety of the Common Basins; and

WHEREAS, GSAs are responsible for ensuring long-term groundwater sustainability through implementation of a GSP; and

WHEREAS, the Parties wish to provide a framework for cooperative groundwater management efforts in the Common Basins to ensure the Act is implemented effectively, efficiently, fairly, and at the lowest reasonable cost.

NOW, THEREFORE, in consideration of the recitals and mutual obligations of the Parties expressed herein, the Parties agree as follows:

1. Purpose

The purpose of this MOU is to establish an understanding between the Parties with regard to preparing a GSP for the Common Basins, including responsibilities and funding obligations.

2. Term

a) This MOU shall become effective upon its execution by both Parties.

b) This MOU will terminate when the Parties agree, in writing, that the GSP is complete to the satisfaction of DWR.

c) Payment obligations under Article 6, Cost Sharing and Payment, and Article 11, Cancellation, shall survive discharge or termination of this MOU until obligations are satisfied.

3. Responsibilities of the Parties

General responsibilities of the Parties regarding the Common Basins are as follows:

a) Ensure all required GSA filings are complete and submitted to DWR by the June 30, 2017 statutory deadline.

b) Develop a schedule to prepare a GSP for the Common Basins for consideration by the Board of Directors of both Parties.

c) Share relevant data on geology, hydrogeology, operations, or other information that may be needed to develop or implement a GSP.

d) Coordinate to conduct stakeholder outreach related to GSP development and adoption.

e) Submit the GSP to DWR by the January 31, 2022 statutory deadline.

f) Ensure all work related to this MOU is performed in accordance with the California Environmental Quality Act and other applicable laws.

g) Coordinate to respond to public comments on the GSP for the Common Basins, as applicable.

h) Address any issues or deficiencies raised by DWR during their review of the GSP within the required time.

i) Explore the role of each Party in implementing the GSP to ensure long-term sustainability and compliance with the Act. The role of each Party will be documented in a future MOU or other agreement. This MOU does not obligate either Party to implement specific groundwater management actions in the Common Basins.

4. Responsibilities of SBCWD

a) SBCWD will act as the contracting entity under this MOU. Subject to approval by SBCWD's authorized representative, SBCWD shall be responsible for executing any Consultant Contract(s) to undertake development of the GSP. SBCWD shall conduct a consultant procurement process that satisfies its own internal consultant procurement policies/criteria.

b) Share relevant data and information with SCVWD as requested.

c) Notify SCVWD of the Consultant(s) selected to develop the GSP.

d) Solicit SCVWD comments on any Consultant Contract(s) related to GSP development prior to execution.

e) Review Consultant invoices for approval and report disputes, if any, to SCVWD within five (5) working days of receipt of invoice. Pay approved invoices and provide copies of invoices to SCVWD with requests for reimbursement as described in Article 6.

f) Solicit SCVWD comments on Consultant deliverables prior to acceptance.

5. Responsibilities of SCVWD

a) Share relevant data and information with SBCWD as requested.

b) Provide comments on proposed Consultant Contract(s) within five (5) working days of receipt.

c) Provide comments on Consultant deliverables within five (5) working days, or other schedule as mutually agreed upon. The SCVWD technical review period for the draft GSP will be a minimum of ten (10) working days.

d) Reimburse SBCWD in accordance with Article 6.

6. Cost Sharing and Payment

The estimated Consultant cost to develop a GSP for the Common Basins is expected to be less than $250,000. Additional Consultant work may be needed to respond to issues raised during DWR review of the GSP. SCVWD agrees to reimburse SBCWD for 10% of the total Consultant cost, with a maximum contribution of $35,000, unless additional funding is authorized in writing through an amendment pursuant to Article 13 of this MOU.

a) SBCWD shall request reimbursement from SCVWD by submitting invoice(s) for incurred Consultant contract costs no more than once a calendar quarter. The invoice(s) shall clearly indicate the SCVWD cost share and shall be accompanied by adequate supporting documentation of related Consultant contract costs, including the hourly rates, hours spent, and information on activities performed in support of the scope of services specified in the Consultant contract(s).

b) Following review and approval of an invoice by SCVWD, SCVWD shall disburse to SBCWD the approved amount within thirty (30) days of receipt of the invoice.

c) An invoice may be rejected by SCVWD only if the invoice contains a material error or paying the invoice would result in SCVWD exceeding its maximum contribution described in this Article. SCVWD shall notify SBCWD of any invoice so rejected, and the reasons therefore.

d) Costs incurred by SBCWD for "in-kind" services including staff time and overhead costs, as well as costs for Consultant oversight, meetings, travel, and incidental expenses shall not be reimbursable by SCVWD.

7. Hold Harmless, Indemnification, Remedies, and Insurance

To the extent permitted by California State law and in proportion to fault, each Party will indemnify, defend, and hold all other Parties and their directors, officers, agents, and employees safe and harmless from any and all claims, suits, judgments, damages, penalties, costs, expenses, liabilities and losses (including without limitation, sums paid in settlement of claims, actual attorneys' fees, paralegal fees, consultant fees, engineering fees, expert fees, and any other professional fees) that arise from or are related in any way to each Party, its employees, officers, or other agents in the operation and/or performance of this MOU; provided, however, that no Party shall indemnify or hold harmless another Party for that Party's own negligent acts, errors, or omissions, or willful misconduct, in the operation and/or performance of this MOU or the performance of the Consultant(s).

Notwithstanding the preceding paragraph, where more than one Party is named in a suit challenging the GSP regarding the Common Basins, or made subject to a claim or penalty regarding the same, the Parties shall coordinate and undertake a joint defense, utilizing a joint defense agreement to the extent possible, subject to the approval of the Parties. Each Party agrees that, to the greatest extent practicable, it shall cooperate in such defense and execute any waivers and/or tolling agreements that may be necessary in order to provide for a single joint defense of such a suit, claim, or imposition of penalty. Any communications between the Parties and any of their respective consultants and attorneys engaged in the joint defense shall be privileged as joint defense communications. Work performed during the joint defense by Consultants or attorneys, to the extent allowed by law, shall be considered attorney work product. Nothing in this paragraph is intended to require a joint defense under circumstances where it would be legally impermissible or under circumstances where it is wholly impractical.

This indemnity provision shall survive the termination of this MOU and the termination of any Party's participation in this MOU. Further, each Party will be liable to the other Party for attorneys' fees, costs, and expenses, and all other costs and expenses whatsoever, which are incurred by the other Party in enforcing this indemnity provision.

In all Consultant contracts funded in whole or part by the Parties, SBCWD shall name the SCVWD and its respective officers, agents, and employees as additional insureds and additional indemnitees in the insurance coverage and indemnity provisions customarily used in the SBCWD professional service contracts.

8. Disputes

Any claim that a Party may have against the other Party regarding the performance of this MOU including, but not limited to, claims for compensation will be submitted to such other Party. The Parties will attempt to negotiate a resolution of such claim and if necessary process an amendment to this MOU or a settlement agreement to implement the terms of any such resolution.

9. Cancellation

If a Party elects to terminate its participation in this MOU, it may do so by delivering to the

other Party a written notice of intention to terminate. Termination shall take effect thirty days following the receipt of notice by the other Party. No portion of the terminating Party's financial contribution provided under this MOU shall be refunded to the terminating Party.

10. Maintenance and Inspection of Books, Records, and Reports

The Parties will, upon reasonable advance written notice, make available for inspection by the other Party all records, books, and other documents directly relating to the GSP or groundwater management for the Common Basins. Prior to release of such documents (other than in response to a request under the California Public Records Act, a subpoena, or court order), all draft information shall be approved by both Parties for finalization and release.

11. MOU Not a Precedent

The Parties intend that the provisions of this MOU will not bind the Parties as to the provisions of any future agreement between them. This MOU was developed specifically for the specified MOU term and purpose.

12. Notices

Any notice, demand, or request made in connection with this MOU must be in writing and will be deemed properly served if delivered in person or sent by Unites States mail, postage prepaid, to the addresses specified herein.

Santa Clara Valley Water District
Attention: Garth Hall, Deputy Operating Officer, Water Supply
5750 Almaden Expressway
San Jose, CA 95118

San Benito County Water District
Attention: Jeff Cattaneo, District Manager
30 Mansfield Road, PO Box 899
Hollister, CA 95024

Any Party may change such contact or address by notice given to the other Party as provided herein.

13. Amendments

The MOU may be amended in the form of written amendment executed by both Parties.

14. Assignment

No Party shall assign, sublet, or transfer this MOU or any of the rights or interests in this MOU without the written consent of the other Party.

15. Severability

The partial or total invalidity of one or more parts of this MOU will not affect the intent or validity or remaining parts of this MOU.

16. Governing Law

This MOU will be deemed a contract under the laws of the State of California and for all purposes shall be interpreted in accordance with such laws.

17. Interpretation

This MOU shall be deemed to have been prepared equally by both Parties, and its individual provisions shall not be construed or interpreted more favorably for one Party on the basis that the other Party prepared it.

18. Contractual Restriction on Consultant's Use of Study Materials

Each Party shall ensure that reasonable contractual restrictions on the consultant's use of the study material and handling of confidential material are included in a written agreement with the consultant.

19. No Third-Party Beneficiaries

This MOU does not and is not intended to confer any rights or remedies upon any person or entity other than the Parties.

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In WITNESS WHEREOF, the parties have executed this MOU as of the effective date.

San Benito County Water District

Approved as to Form

NAME PAULO E. PIRAL
General Counsel

Jeff Cattaneo
General Manager

7/5/17
Date

Santa Clara Valley Water District

Approved as to Form

Erick Soderlund
Assistant District Counsel

Norma Camacho
Interim Chief Executive Officer

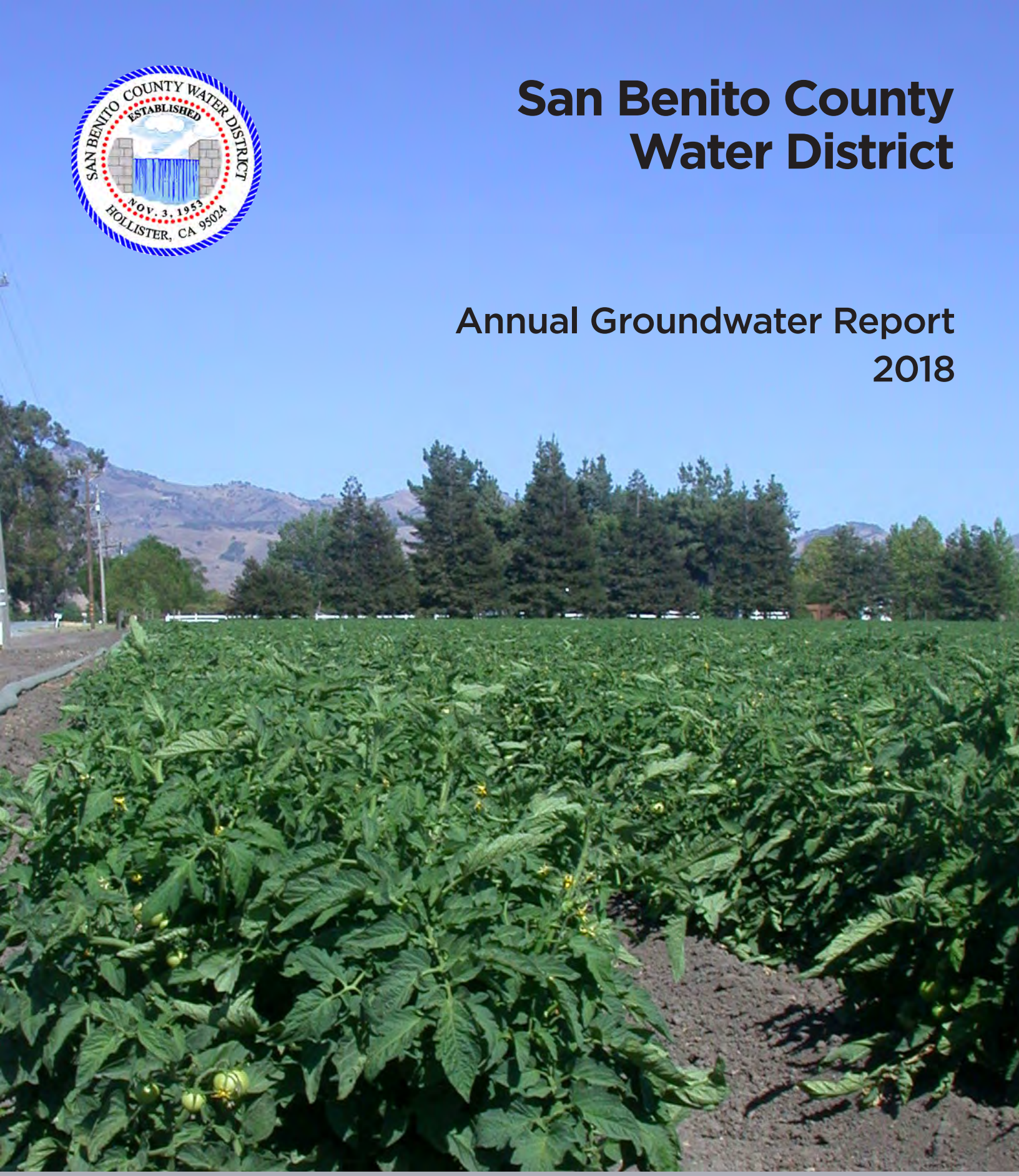
6/19/2017
Date

I LIST OF ACRONYMS

AF	acre-foot
AFY	acre-foot per year
ag	agriculture
CASGEM	California Statewide Groundwater Elevation Monitoring
CDHSPH	California Department of Public Health
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
COC	Constituent of Concern
CVP	Central Valley Project
District or SBCWD	San Benito County Water District
DWR	California Department of Water Resources
DWTP	Domestic Wastewater Treatment Plant
ET	evapotranspiration
ft	feet
gpd	gallons per day
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
gw	groundwater
IRWMP	Integrated Regional Water Management Plan
ITRC	Irrigation Training and Research Center, California Polytechnic State University
IWTP	Industrial Wastewater Treatment Plant
M&I	Municipal and Industrial
MGD	million gallons per day
OCR	Optical Character Recognition
pdf	Adobe Acrobat Portable Document Format
PVWMA	Pajaro Valley Water Management Agency
RW	recycled water
RWQCB	Regional Water Quality Control Board
SCVWD	Santa Clara Valley Water District
SEIR	Supplemental Environmental Impact Report
SGMA	Sustainable Groundwater Management Act
SLDMWA	San Luis & Delta-Mendota Water Authority
SSCWD	Sunnyslope County Water District
USBR	U.S. Bureau of Reclamation
UWMP	Urban Water Management Plan
WRA	Water Resources Association of San Benito County
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WY	water year

San Benito County Water District

Annual Groundwater Report 2018



TODD GROUNDWATER

ANNUAL GROUNDWATER REPORT

December 2018

TODD GROUNDWATER

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SIGNATURE PAGE

Iris Priestaf, PhD

President

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EXECUTIVE SUMMARY

This Annual Groundwater Report for San Benito County Water District (District) describes groundwater conditions in the San Benito County portion of the Gilroy-Hollister Basin. Prepared at the request of the District Board of Directors and consistent with the special act of the State that established the District, it documents water sources and uses, groundwater elevations and storage, and management activities for water year 2018 and provides recommendations.

2018 was a dry year. However, Central Valley Project (CVP) water allocations for agriculture and for municipal uses for March 2017-February 2018 were set at 100 percent of the contract and for March 2018-February 2019 were set at 50 percent and 75 percent respectively. The District is using this available imported water, providing it to agricultural users, treating CVP water in the newly-expanded Lessalt and newly-completed West Hills water treatment plants for municipal users, and percolating CVP water in off-stream ponds. In 2018, groundwater elevations generally rose across the basin. Overall, the basin is recovering from the most recent drought (2011-2016) but at a slower rate than in the wet year of 2017. Groundwater storage increased overall despite local declines in Pacheco and Bolsa subbasins.

The District has effectively managed water resources in San Benito County for decades. Working collaboratively with other agencies, the District has eliminated historical overdraft, developed and managed multiple sources of supply, established an effective water conservation program, protected water quality, and provided annual reporting.

Passage of the Sustainable Groundwater Management Act (SGMA) in 2014 has created a new framework for groundwater basin management, monitoring, and reporting by local agencies and the District has responded proactively, becoming the exclusive Groundwater Sustainability Agency (GSA) for the subbasins of the Gilroy-Hollister Basin within San Benito County and the adjoining Tres Pinos Valley Basin. As of 2018, SBCWD is progressing toward consolidation of these basins into a single North San Benito Basin and has initiated preparation of a Groundwater Sustainability Plan (GSP) for the North San Benito Basin. In 2018, SBCWD was awarded a State-funded grant of $830,000 to help fund preparation of the GSP.

GSP development in the North San Benito Basin is based on a strategy to:

- Build on existing monitoring, management, and reporting
- Extend existing monitoring, management, and reporting to the entire North San Benito Basin
- Update and refine existing plans, programs, and management tools to address SGMA criteria
- Comply with SGMA requirements and preserve local control of groundwater management.

This strategy recognizes that, while historical management has been effective, SGMA has requirements that are more detailed and comprehensive than ever before. This affects the Annual Reports, which are being modified to satisfy SGMA and GSP regulations, while continuing to fulfill requirements of the District Act. Consistent with the District Act, recommendations are provided regarding continuation of District importation of CVP water and percolation activities and definition of groundwater charges. A key recommendation is to expand the District's groundwater monitoring network to the entire North San Benito Groundwater Basin and to improve the monitoring program to ensure accurate and consistent data for the Annual Reports and for GSP development.

1-INTRODUCTION

The San Benito County Water District (District or SBCWD) was formed in 1953 by a special act (District Act) of the State with responsibility and authority to manage groundwater. The District Act allows the Board of Directors to require an annual investigation and report on groundwater conditions of the District and its zones of benefit, such as Zone 6, the area for distribution of Central Valley Project (CVP) water. As documented in **Appendix A,** the District Act specifies the minimum content of the report should the District choose to prepare one. Annual Reports have been prepared historically to analyze the status of the groundwater basin, to evaluate conditions in the next year, and to provide management recommendations. Previous Annual Reports have focused on portions of the Gilroy-Hollister Basin within San Benito County and on Zone 6.

With passage of the Sustainable Groundwater Management Act (SGMA) in 2014, the State has created a new framework for groundwater basin management, monitoring, and reporting by local agencies. The District has responded proactively. In 2017, the District became the exclusive Groundwater Sustainability Agency (GSA) for the subbasins of the Gilroy-Hollister Basin within San Benito County and in 2018 became GSA for the adjoining Tres Pinos Valley Basin. Santa Clara Valley Water District (SCVWD) is the GSA for small portions of the Gilroy-Hollister basin in Santa Clara County. Recognizing that the Gilroy-Hollister and Tres Pinos Valley basins are hydraulically connected, SBCWD is seeking their consolidation into a single basin, termed the North San Benito Basin. SBCWD currently is preparing a Groundwater Sustainability Plan (GSP) for the North San Benito Basin in cooperation with SCVWD for the small portions of the newly defined basin within Santa Clara County. In 2018, SBCWD was awarded a State-funded grant of $830,000 to help fund preparation of the GSP.

Consistent with the District Act and prepared at the request of the District, this Annual Report documents water supply sources and use, groundwater elevations and storage, and District management activities from October 2017 through September 2018. It fulfills the minimum content for a District Annual Report and presents an overview of the state of the groundwater basin with recommendations for management. It conveys considerable information, including tables and figures, which are provided largely in **Appendices B through E**. **Appendix F** provides information on water rates and charges and **Appendix G** contains a list of acronyms.

The sections of this Annual Groundwater Report have been reorganized relative to recent Annual Reports; this reorganization is intended to support a transition to annual reporting as required by SGMA and the SGMA GSP Regulations. As development of the GSP proceeds over the next three years, the SBCWD Annual Reports may be modified further to ensure compliance with SGMA. While complying with GSP regulations, Annual Reports will also adhere to requirements for SBCWD annual reporting, as described in the District Act.

Acknowledgments

This report was prepared by Iris Priestaf, PhD, Maureen Reilly, PE, and Chad Taylor, PG, CHG of Todd Groundwater. We appreciate the assistance of San Benito County Water District staff, particularly Jeff Cattaneo, Sara Singleton, Garrett Haertel, and David Macdonald.

2-GEOGRAPHIC AREA

As described below, the geographic area and boundaries of local groundwater basins have been defined differently by the District and by the California Department of Water Resources (DWR) for their specific purposes. Like previous annual reports, this Annual Report focuses on the northern San Benito County portions of the Gilroy-Hollister Groundwater Basin, including the Bolsa, Hollister, and northern San Juan Bautista subbasins. Nonetheless, it is recognized that the North San Benito Basin (Basin) extends farther to the south and the entire basin is the subject of the GSP. To support a transition to SGMA, the monitoring program is being improved and extended south; a summary is provided in this report.

District-Defined Subbasins

For the past 22 years, the Annual Reports have focused on subbasins delineated in 1996 and based on hydrogeologic and other local factors (e.g., Zone 6 boundaries). These subbasins are shown in **Figure 2-1.** Six of these subbasins are defined within Zone 6, including Bolsa Southeast (SE), Pacheco, Hollister East (North and South), Tres Pinos, Hollister West, and San Juan subbasins. The seventh is the Bolsa subbasin; of the subbasins shown on the map, only the Bolsa subbasin receives no direct CVP deliveries and relies on local groundwater.

DWR-Defined Basins

As the District proceeds with SGMA planning and implementation, its area of focus is changing from the 1996-defined subbasins to the North San Benito Basin and GSP area outlined in **Figure 2-2**. The GSP area includes the Bolsa, Hollister, and San Juan Bautista subbasins of the Gilroy-Hollister Basin and the Tres Pinos Valley Basin previously defined by DWR. Groundwater basins wholly or partially in San Benito County as defined historically by DWR are shown in Figure C-1 in Appendix C.

The Plan Area is predominantly in San Benito County with small portions of the Hollister and San Juan Bautista subbasins extending into Santa Clara County. Recognizing that these basins are contiguous, hydraulically connected, and comprehensively managed, in 2018 SBCWD submitted a request to DWR to consolidate the four basins into a single basin, termed the North San Benito Basin. As of November 29, this consolidation has draft DWR approval. Over the next few years, the annual report will transition from examining trends by subbasin to management areas. These management areas will be defined as part of the GSP process.

Monitoring Programs

Data from monitoring programs undertaken by local, state, and federal agencies are summarized below as currently incorporated in the Annual Report. The District data compilation and monitoring programs are likely to be expanded and revised in the future as data needs are identified in the GSP, for example to address topics such as subsidence and to represent the entire North San Benito Basin.

Climate. Climate data are regularly compiled from DWR's California Irrigation Management Information System (CIMIS) and include: total solar radiation, soil temperature, air temperature/relative humidity, wind direction, wind speed, and precipitation. Two CIMIS stations are active in the GSP Area, both of which also measure evapotranspiration (ETo):

- #126 San Benito, located at the SBCWD office on Mansfield Road with a record beginning in June 1994
- #143, San Juan Valley, located at the San Juan Oaks Golf Course with a record beginning in January 1998.

Historical rainfall data are available for Hollister dating back to 1874. For the Annual Groundwater Reports, historical annual precipitation has been compiled and reported using the Hollister rain gage for water years 1875-1995 and the CIMIS San Benito station thereafter. Monthly precipitation and evapotranspiration data for the Hollister #126 CIMIS station are tabulated in **Appendix B**.

Surface water flows and percolation. Surface water monitoring is summarized in **Appendix C** of the Annual Groundwater Reports (e.g., Todd, 2017). **Appendix C** includes Figure C-1 showing groundwater basins and Figure C-2 showing the location of five active and eight inactive USGS stations in and near the San Benito River system. The period of record also is shown; streamflow data are regularly downloaded. Figure C-3 shows 30 locations (including Pacheco Creek in Santa Clara County) with miscellaneous surface water measurements taken by the District. These measurements were associated with various studies, many involving evaluation of streamflow percolation to groundwater. While these locations have not been monitored since 2013, the data may provide useful as part of GSP planning and implementation, specifically in considering historical groundwater-surface water interactions and in evaluating potential managed aquifer recharge.

Appendix D summarizes reservoir water budget information for Hernandez, Paicines, and San Justo reservoirs and provides annual total releases from Hernandez and Paicines reservoirs from Water Year 1996 to present. For Water Year 1994 to present, percolation of imported CVP water is documented in Table D-3 and percolation of wastewater is shown in Tables D-4 and D-5.

Wells and groundwater pumping. SBCWD monitors groundwater pumping in Zone 6. Pumping amounts are calculated semiannually by metering the number of hours of pump operation and multiplying by the average discharge rate, which is measured a few times per year. This monitoring program began in

about 1990 (soon after CVP imports started) and was based on recognition that CVP imports resulted in reduced pumping, increased recharge, and sustainable groundwater storage with regional benefits. This contrasts with other California basins where imported water was used to increase irrigated acreage (L&S, 1991) without managing effectively for sustainability. Irrigation pumping beyond Zone 6 is not monitored but has been estimated for regular water budget updates based on land use information and water use factors. Groundwater pumping data and estimates are summarized by major use category and subbasin in **Appendix E.**

Groundwater levels. SBCWD has had a semi-annual groundwater level monitoring program since Water Year (WY) 1977; groundwater level data gathered by USGS and other agencies are available as early as 1913 (Clark, 1924). The Annual Groundwater Reports provide quarterly groundwater level data in **Appendix C** for each year. The data are the basis for groundwater level contour maps, change maps, hydrographs, groundwater level profiles, and storage change computations presented in the Annual Reports. The SBCWD monitoring program includes wells in the Pacheco Valley in Santa Clara County. SCVWD's monitoring program provides data for the southern Llagas Basin; these shared data are used in the SBCWD annual groundwater level maps.

SBCWD is the designated CASGEM monitoring agency for the GSP Area; CASGEM data are available from DWR's online Groundwater Information Center Interactive Map (GICIMA).

Land use. Land use maps have been prepared by DWR for San Benito County, with the earliest maps in 1967. GIS-based land use maps are available online for 1997, 2002, and 2014 with the DWR Land Use Viewer (DWR, 2018b). In 2012, SBCWD prepared an update of the 2002 map to 2010 using 2010 aerial photography. The 1997, 2002, and 2010 maps were used in preparing the Salt and Nutrient Management Plan (Todd, 2014) and in updating water budgets for the 2014 Annual Groundwater Report.

Water quality. In 1997, SBCWD initiated a program for monitoring nitrate and electrical conductivity (EC) in wells. In 2004, SBCWD established a comprehensive water quality database that contains over 450,000 records from water systems and regulated facilities. The database has been updated on a triennial basis as part of the Annual Reports; for the 2016 update, maps and data are provided in an appendix of that report. SBCWD surface water quality monitoring sites also are identified. Monitoring for the Salt and Nutrient Management Plan is closely coordinated.

State-wide sources of groundwater quality data include the Water Data Library (WDL), Geotracker/GAMA program, and the State Water Resources Control Board's Division of Drinking Water. These are accessed for the triennial update of the SBCWD Water Quality Database.

Units and accuracy. Throughout this report, water volumes and changes in storage are shown to the nearest acre-foot (AF). These values are accurate to one to three significant digits (depending on the measurement). All digits are retained in the text to maintain as much accuracy as possible during subsequent calculations, but results should be rounded appropriately.

Improvements in Monitoring

In 2018, the District initiated a program to increase the number of wells for the groundwater level and groundwater quality monitoring programs. This recognizes that recent years have been marked by a declining number of wells in the program. Gradual attrition in monitored wells is a common problem where private production wells are used for monitoring and then become unavailable, for example due to loss of access or loss of the well (damaged or destroyed). Nonetheless, such attrition results in gaps in the monitoring network, interruptions in historical trend data, and an inability to analyze annual and long-term storage changes (because such analysis requires consistent pairing of annual measurements). The District program recognizes that the GSP process requires more comprehensive and rigorous monitoring.

Accordingly, the District has developed a plan to identify new locations and has detailed the process in a memorandum (**Appendix C**). Figure C-7 depicts the Basin in terms of groundwater monitoring coverage and shows target areas where additional monitoring sites are needed. The District's methodology to select existing wells or new well locations for addition to the program includes:

- Identifying Assessor Parcel Numbers in areas indicated as needing additional monitoring
- Searching through District well permit files to find existing wells in the areas of need
- Examining aerial photographs to verify the locations of permitted wells, and
- Examining the aerial photographs to identify other wells with subsequent documentation or confirmation of the well by APN or another identifier
- Identifying the well owner, requesting permission to access the well for water level measurements and/or sampling of water quality
- Once permission is granted, visiting the site and determining the method of measurement/testing
- Evaluating wells previously monitored but no longer active. This involves communicating with the owner and assessing the need for renewed access or repair.

Subsequently, information on the wells under consideration for monitoring will be summarized. The summary will include a map showing locations relative to the areas of need, tabulation of major well characteristics (construction, depth, use), and other considerations. This summary will be used to select and prioritize wells for incorporation into the program and to develop an action plan and schedule for implementation of the program. The District also is considering the possibility of pursuing grant funding for construction of dedicated monitoring wells.

This process of identifying, evaluating, and securing new monitoring sites will recur throughout the SGMA process. The GSP now under preparation will address the design of a monitoring program (including monitoring network and protocols); subsequently, SGMA requires GSP updates every five years.

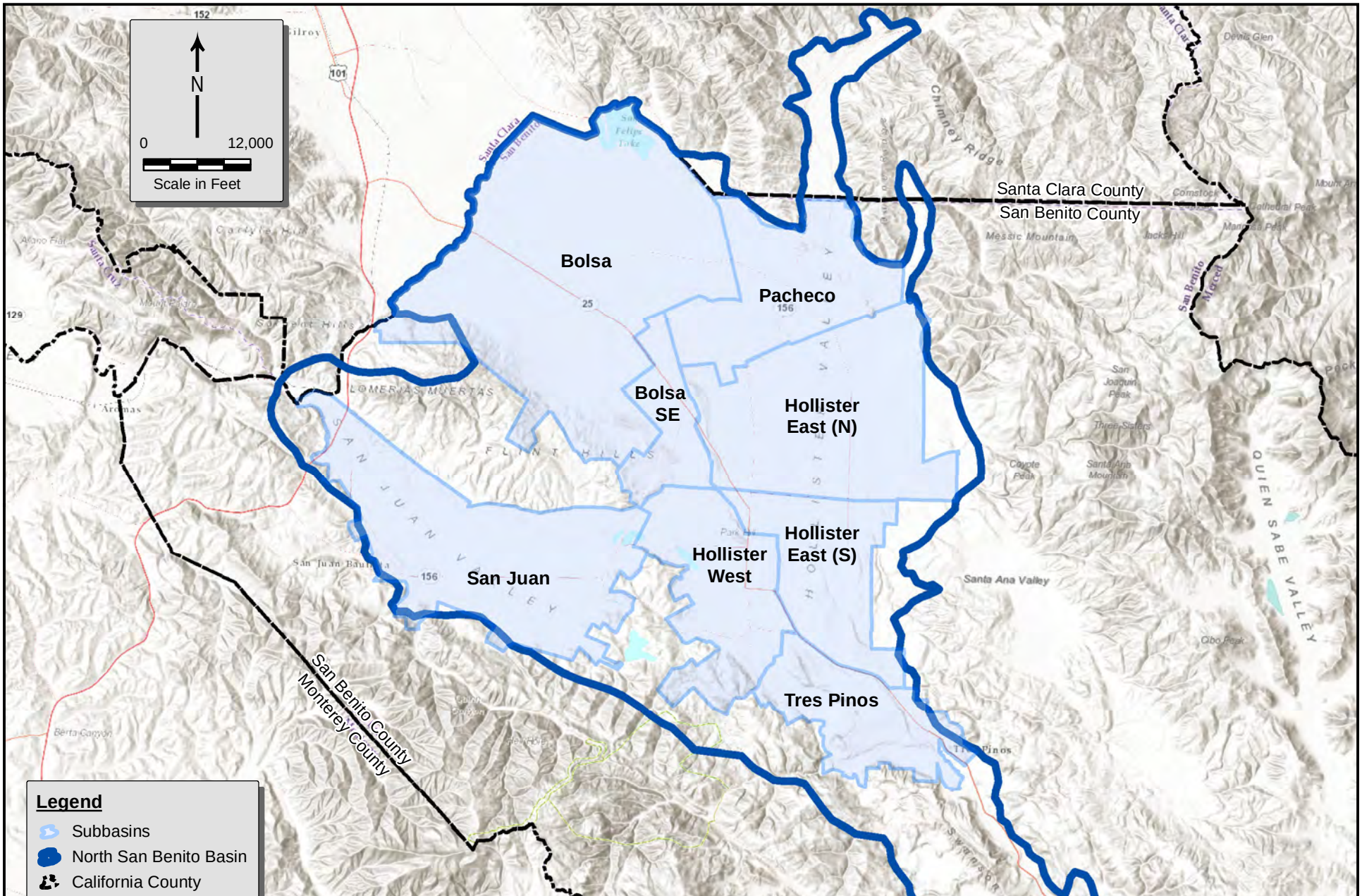

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Figure 2-1
District Subbasins Defined in 1996

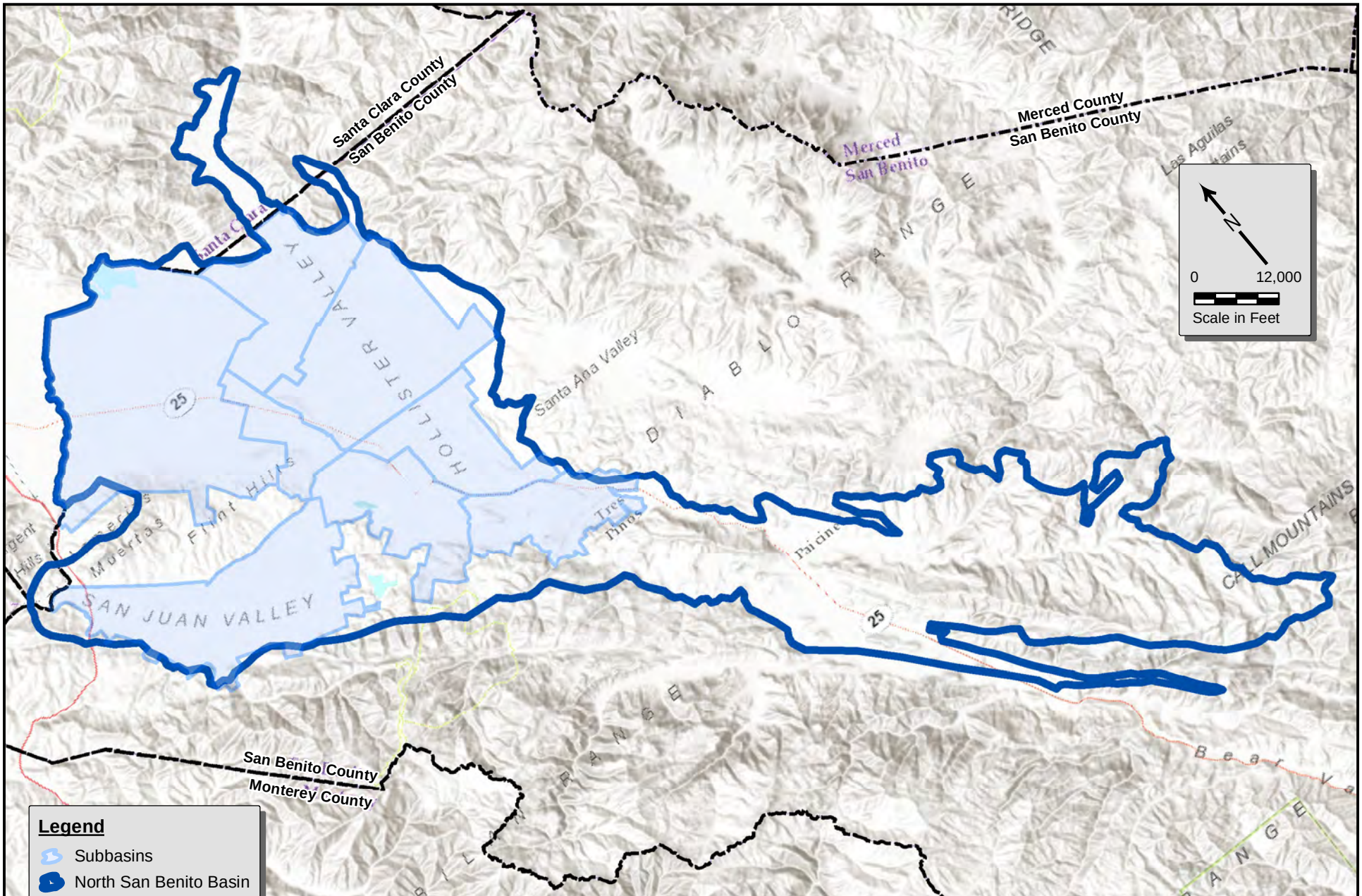

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Figure 2-2
GSP Area and
1996-defined Subbasins

3-BASIN CONDITIONS

The Annual Report summarizes basin conditions including climate, groundwater elevations, groundwater storage, and groundwater level trends. Overall, Water Year 2018 was a dry hydrologic year, but CVP allocations remained high following the wet year of 2017.

Climate

Assessment of climatic conditions begins with collection of climate data (rainfall and evapotranspiration), which are summarized in **Appendix B**. Local rainfall amounts are compiled on a monthly basis and reviewed as an increasingly variable factor that affects basin inflows (e.g., deep percolation) and outflows (groundwater pumping). Recognizing that drought often is extensive across California, local dry years also may be indicative of regional drought and reduced CVP allocations. Dry years often are characterized by increased groundwater pumping for agricultural irrigation to offset lack of rainfall and reduced CVP allocations.

In 2018, overall precipitation was 8.3 inches as shown in **Figure 3-1** and documented in **Appendix B**. As shown in **Figure 3-2**, most years have been below- or near-average rainfall and relatively few years have abundant rainfall, especially since 1998. Water year 2018 was 65 percent of normal, reflecting a dry year. The basin is still recovering from the drought of 2011-2016 and another dry year may further stress groundwater reserves. With a weak-moderate El Nino expected for the 2018-2019 winter, rainfall predictions remain uncertain.

The Annual Report has relied on CIMIS station #126 since Water Year 1995. The station, located in Hollister, is maintained by the District. In recent years, the precipitation data have been affected by periodic irrigation overspray that has been recorded on the sensors. The District is considering means to resolve this problem.

Water Year Type

SGMA requires categorization of *water year type,* which is a classification of the amount of annual precipitation in a basin. Water year type is intended to aid in the evaluation of information such as water level hydrographs and groundwater storage changes. **Table 3-1** documents the classification developed for North San Benito, which uses five water year types (critically dry, dry, normal, above normal, wet). The methodology for defining the water year types is based on DWR's Water Budget Best Management Practice (BMPs) Document (DWR, 2016) and is consistent with DWR water year typing in the Central Valley which has been applied to years back to 1924. For North San Benito, the annual rainfall amounts in Hollister over the past 30 years (1988-2018) were expressed as percentages of average annual rainfall. These were then sorted into quintiles, reflecting the five categories. The sorting into quintiles resulted in the classification shown in Table 3-1. The water years from 1924 to 2018 were then classified using the numeric values in Table 3-1. The classified years are illustrated in **Figure 3-3.**

The water year classification is based on local Hollister rainfall as representative of the Basin and San Benito River watershed. Local precipitation is important for the overall water balance of the area. While CVP allocations are based on precipitation patterns in the Sierra and Central Valley and are critical to avoiding overdraft, local precipitation has a larger impact by volume on the groundwater basin. Surface water recharge, deep percolation, and irrigation demand are all dependent on local rainfall.

Table 3-1. Water Type Classification

Water Year Type		Range of percent normal
Wet	W	>125
Above Normal	AN	100-125
Below Normal	BN	80-100
Dry	D	65-80
Critically Dry	C	<65

Groundwater Elevations

In October 2018, the District collected groundwater elevations in 97 wells. **Table 3-2** tallies the number of monitored wells by subbasin and **Figure 3-4** shows the well locations in the current monitoring network and the groundwater elevation contours for October 2018.

Groundwater elevations have generally risen throughout the basin over 2018, except for northern portions of Bolsa and Pacheco. Overall, the basin is still recovering from the most recent drought (2011-2016) but at a slower rate than in the wet year of 2017. More information is in **Appendix C.**

Table 3-2. 2018 Monitoring Network

Subbasin	Number of Wells
San Juan	12
Hollister West	9
Tres Pinos	12
Pacheco	13
Northern Hollister East	10
Southern Hollister East	2
Bolsa SE	1
Bolsa	14
Other Subbasins	24
Total	**97**

Change in Storage

Groundwater elevation changes from October 2017 to October 2018 were used to determine the change in storage. **Figure 3-5** displays change data spatially with a color ramp, ranging from red that indicates as much as a 60-foot decline in groundwater levels to blue that indicates as much a 60-foot increase in storage. Groundwater levels and storage continue to recover across the basin. Most areas have shown slight increases (less than 20 feet) from 2017, except portions of Pacheco and Bolsa.

Change is storage is the net volume of water added to or removed from the basin over the water year. The change in storage was calculated using the change in groundwater elevations (feet) and multiplying by the total area (acres) to determine the total bulk volume of change. This bulk volume of change was then multiplied by the average storativity of the subbasin to represent the amount of water that a given volume of aquifer will produce. The storativity values for each subbasin were derived from a numerical model of the basin developed by Yates and Zhang (2001). **Table 3-3** documents the change in groundwater storage.

Figure 3-6 shows the cumulative change in storage for each subbasin over time; the graph extends from 2005 to present, reflecting available data and consistent methodology, but may be extended into the past for the GSP. As shown, groundwater storage was relatively steady from 2005 to 2012. Water years 2012 through 2016 show the decline in storage due to decreased recharge and increased groundwater production during the drought. All subbasins showed recovery in 2017 and most continued this recovery in 2018. San Juan subbasin had the most significant decline in groundwater storage and while recovering, groundwater elevations have not returned to pre-drought levels.

Table 3-3. 2018 Change in Groundwater Storage

Subbasin	Subbasin Area (Acres)	Average Change in Groundwater Height (feet)	Change in Volume (Acre-Feet)	Average Storativity	Change in Storage (Acre-Feet)
San Juan	11,708	3.55	41,538	0.05	2,077
Hollister West	6,050	9.51	57,559	0.05	2,878
Tres Pinos	4,725	0.91	4,314	0.05	216
Pacheco	6,743	-2.41	-16,281	0.03	-488
Northern Hollister East	10,686	2.55	27,281	0.03	818
Southern Hollister East	5,175	7.23	37,418	0.03	1,123
Bolsa SE	2,691	7.17	19,286	0.08	1,543
TOTAL ZONE 6			**171,115**		**8,166**
Bolsa	20,003	-2.57	-51,374	0.01	-514
TOTAL BASIN-WIDE			**119,741**		**7,652**

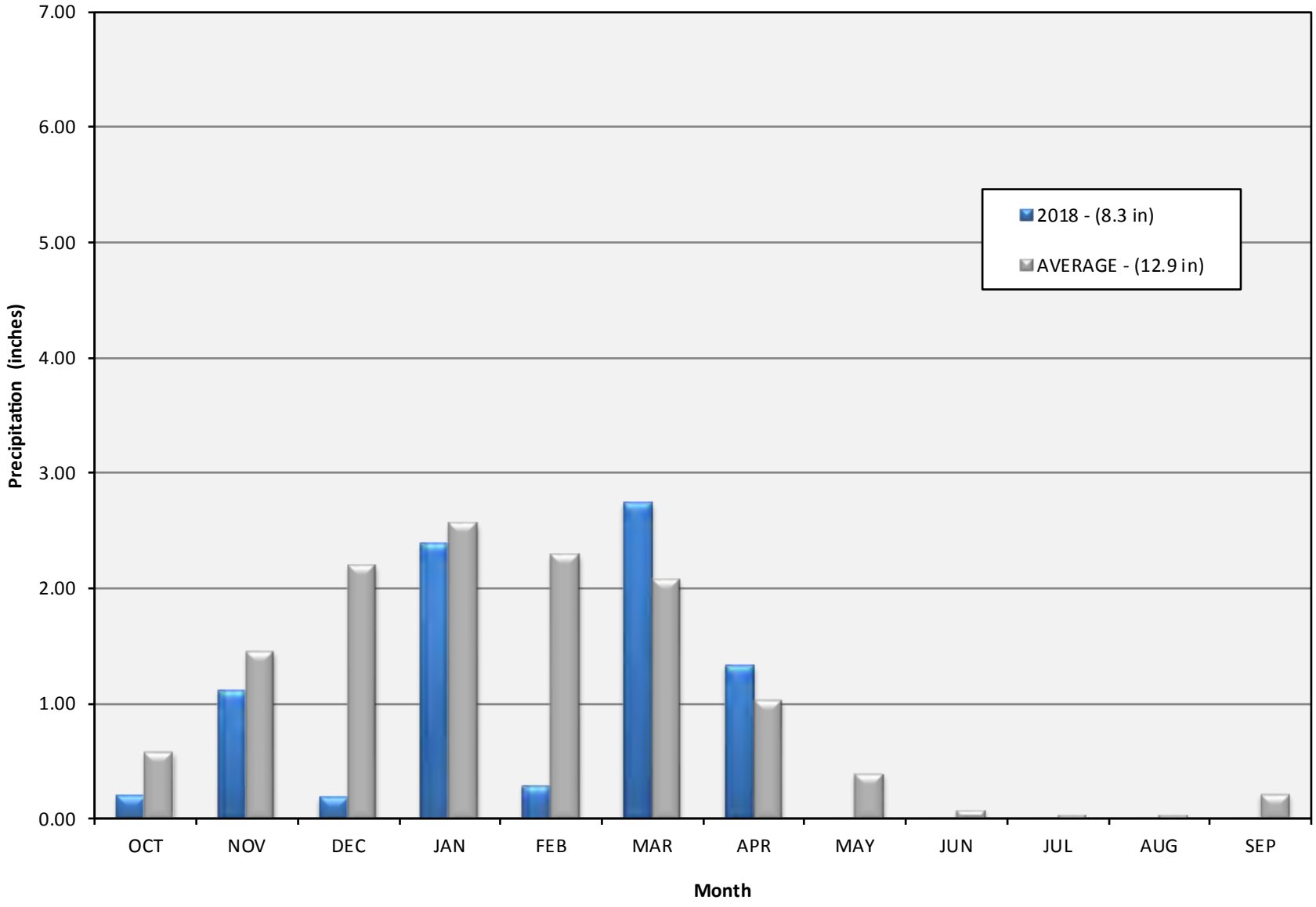
Groundwater Trends

Long term changes in groundwater elevations are illustrated in composite hydrographs; such hydrographs have been prepared annually since the early 1990s. These composite hydrographs are generated by averaging elevations from key wells from each subbasin for each monitoring event. The key well locations are shown on **Figure 3-7** and **Figure 3-8** shows the composite hydrographs. It should be noted that these subbasin hydrographs represent average conditions in each subbasin and illustrate long-term trends, but do not show localized variations in groundwater elevations. Review of the composite graphs reveals recovery from historical overdraft, effects of dry and wet years, and seasonal effects.

SGMA and GSP regulations require preparation of groundwater level hydrographs for specific sites (i.e., not composite) that depict long-term groundwater elevations and historical high and lows. This Annual Report presents seven such hydrographs in **Figure 3-9**, which have been selected for their geographic distribution across the basin and for their respective long and relatively complete historical records. Groundwater levels are expressed in terms of feet above mean sea level (msl). Review of the hydrographs shows the following major features:

- Effects of historical overdraft on groundwater levels. Prior to the first delivery of CVP water (beginning September 1987), a state of overdraft affected the basin. This is most clearly shown by the hydrograph for Hollister East (which shows groundwater level declines from 200 feet msl to nearly sea level) but is apparent in other hydrographs.
- Recovery from historical overdraft after 1987 is apparent in the rise of groundwater levels, followed by general flattening of groundwater level trends with conjunctive management. This is apparent in the Hollister West and San Juan graphs among others.
- Groundwater levels also respond to wet cycles and drought; for example, the wet years in the early 1980s are apparent from groundwater level increases in Pacheco, Hollister West, and San Juan and likely reflect substantial stream percolation. Response to drought is indicated, for example, by groundwater level declines during the recent drought.

The District Act (see Appendix A) requires presentation of estimates of annual overdraft for the current water year and ensuing water year. Consistent with previous Annual Reports, this is interpreted as long-term groundwater level declines with accounting for rainfall conditions and CVP imports. As of 2018, groundwater elevation trends do not indicate overdraft. Recovery following the drought indicates that overdraft is not anticipated for 2019.



Data have been affected by irrigation overspray.

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Figure 3-1
Water Year
2018 Precipitation

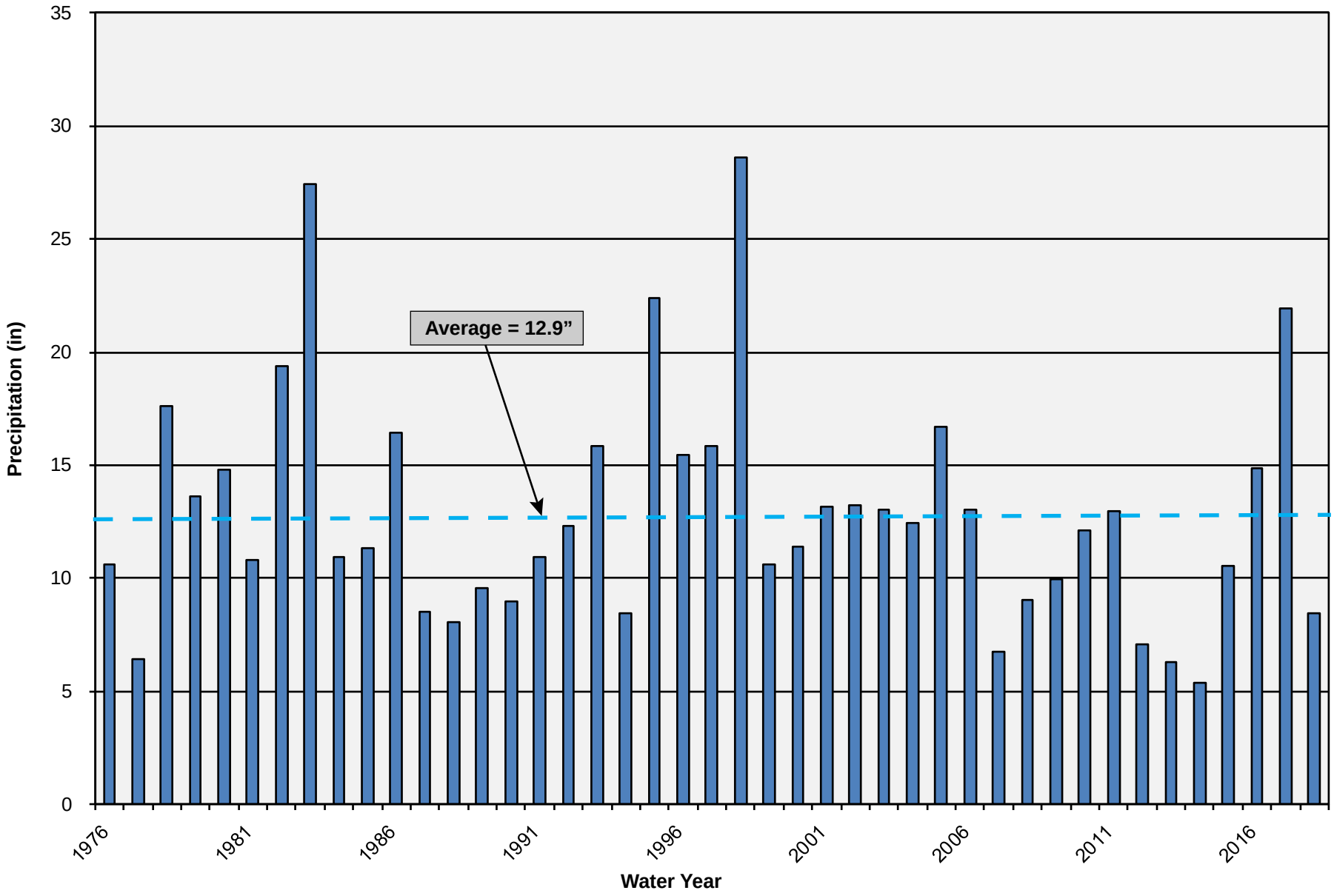

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Figure 3-2
Annual Precipitation
1976 - 2018

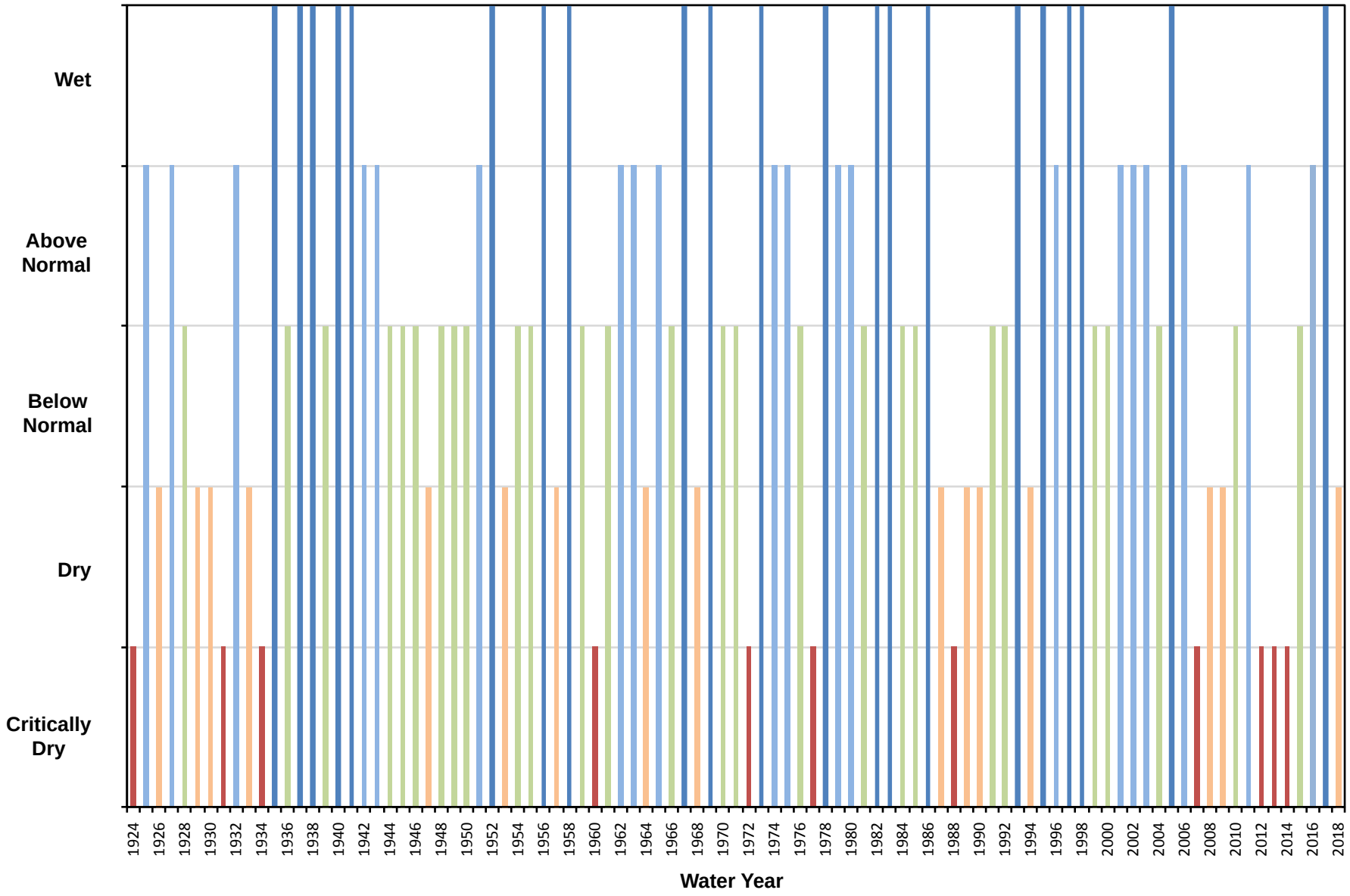

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Figure 3-3
Water Year Classification

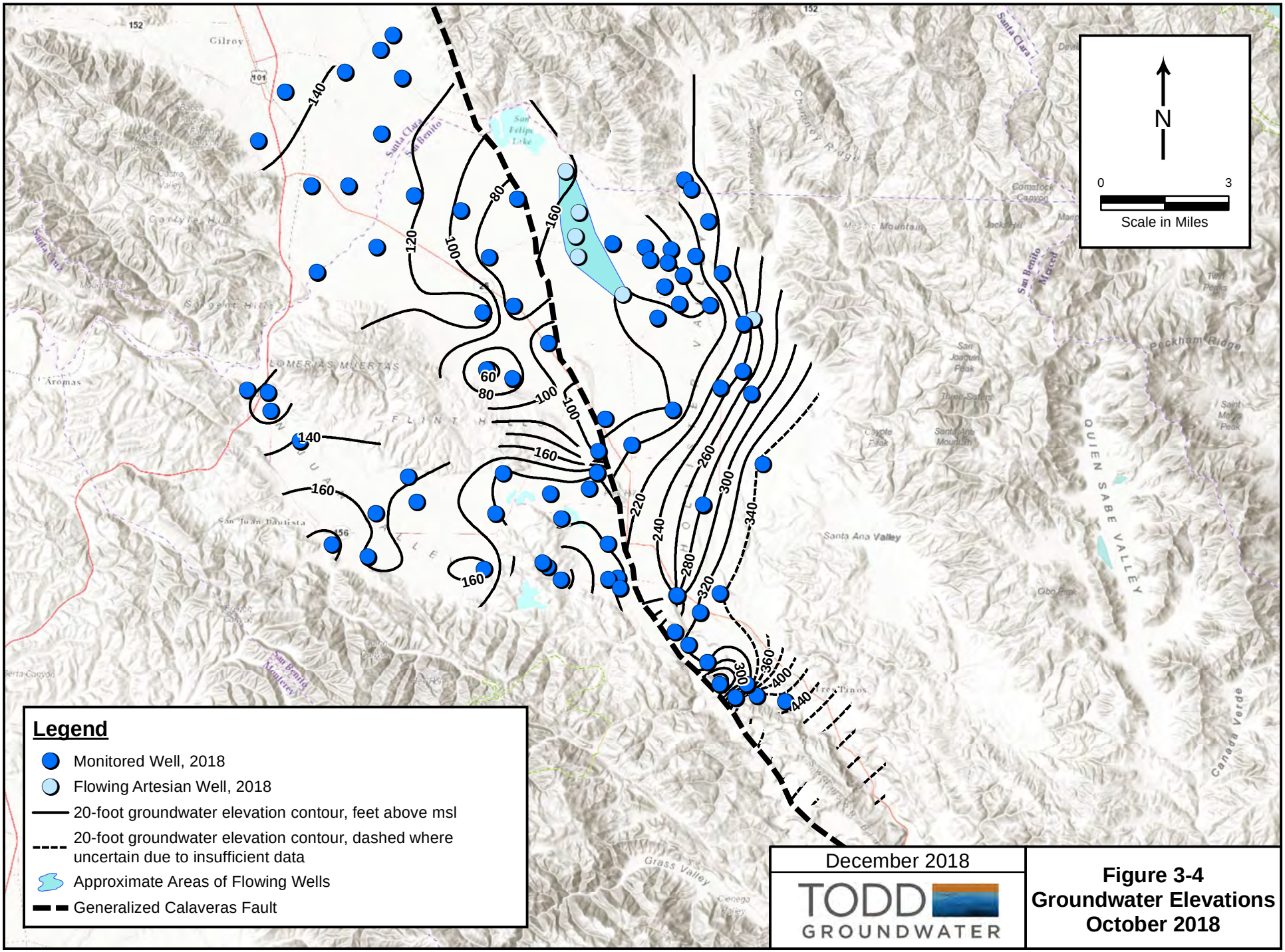

Figure 3-4
Groundwater Elevations
October 2018

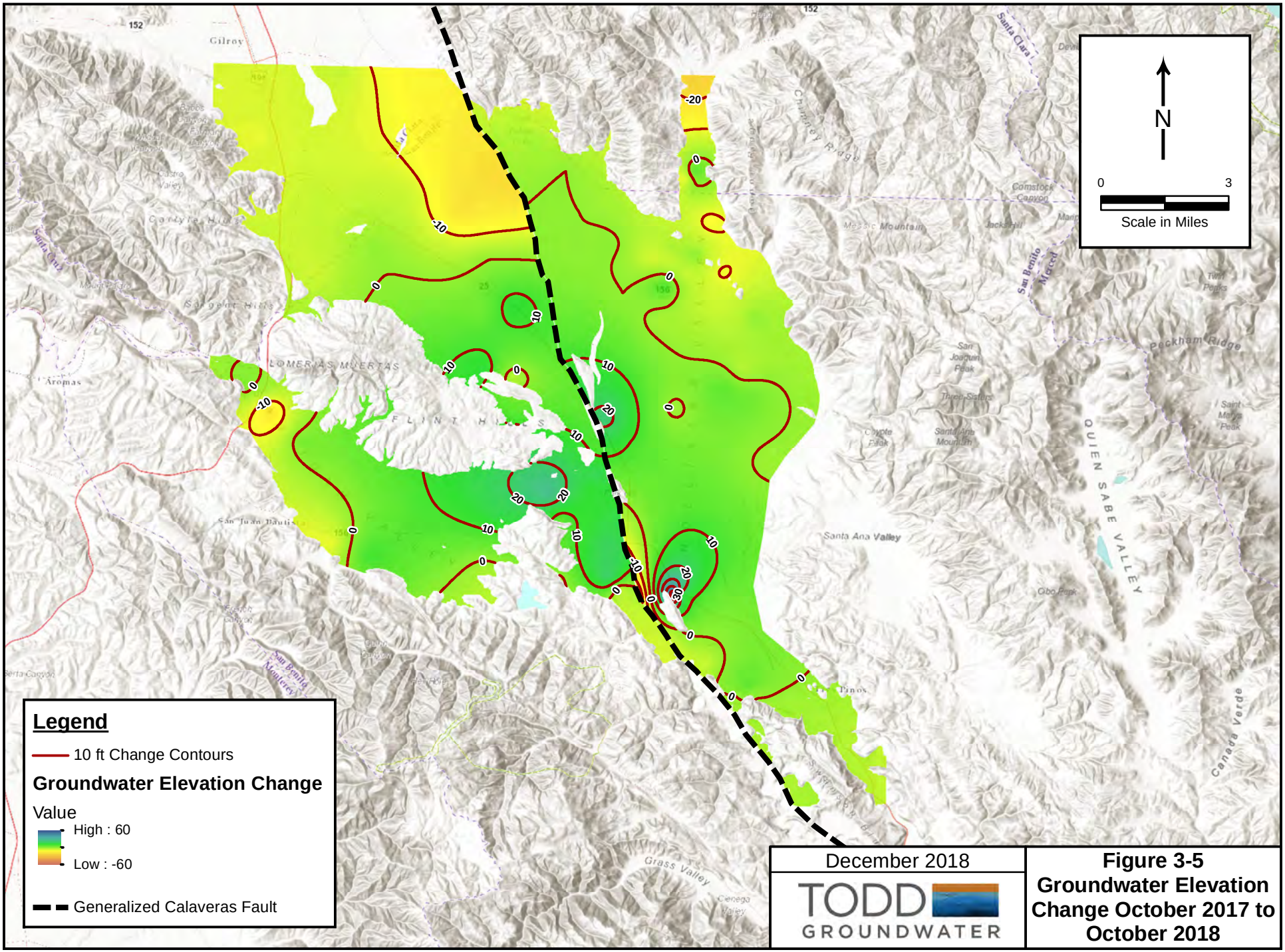

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Figure 3-5
Groundwater Elevation Change October 2017 to October 2018

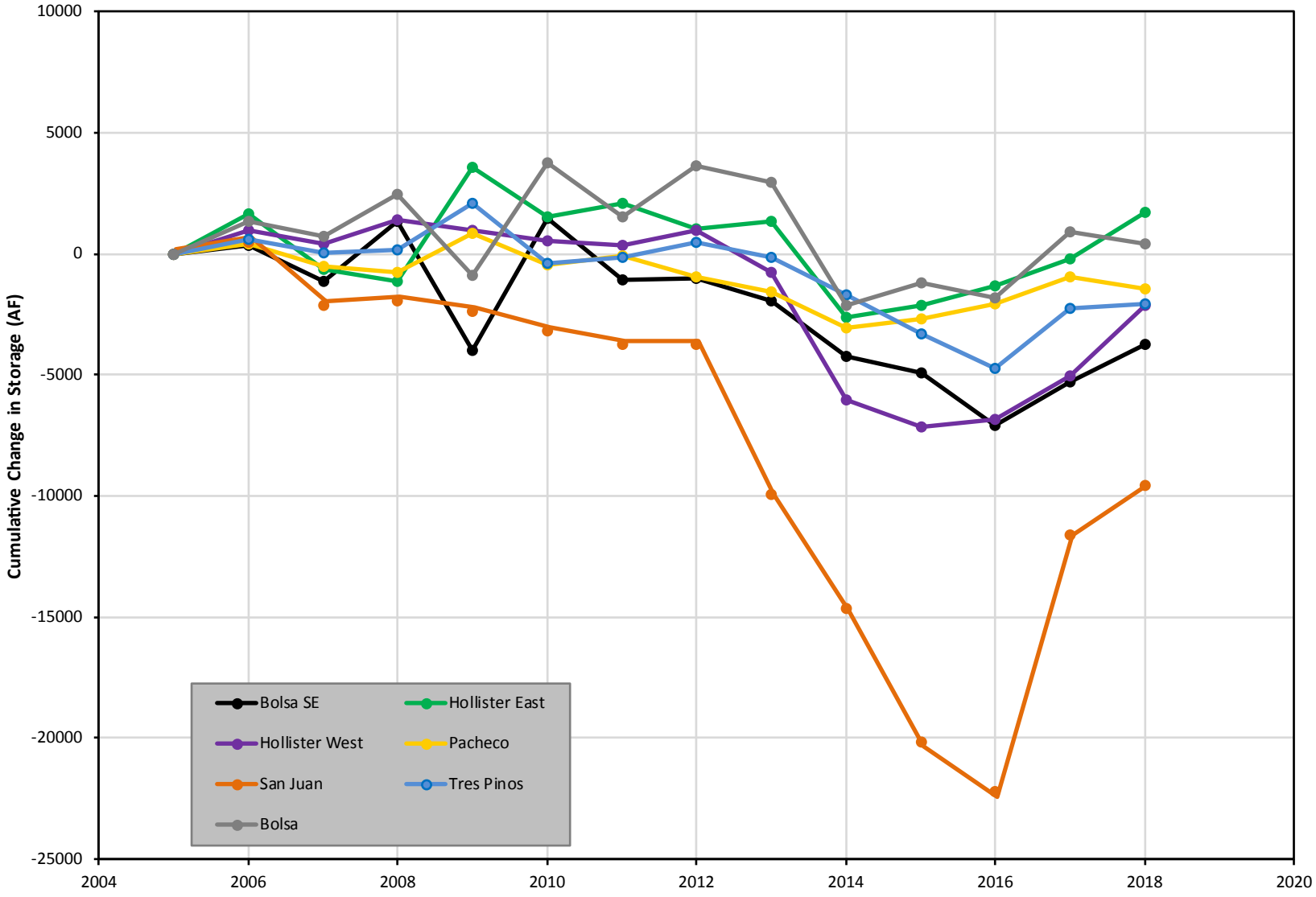

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Figure 3-6
Cumulative Change in Storage
2005 - 2018

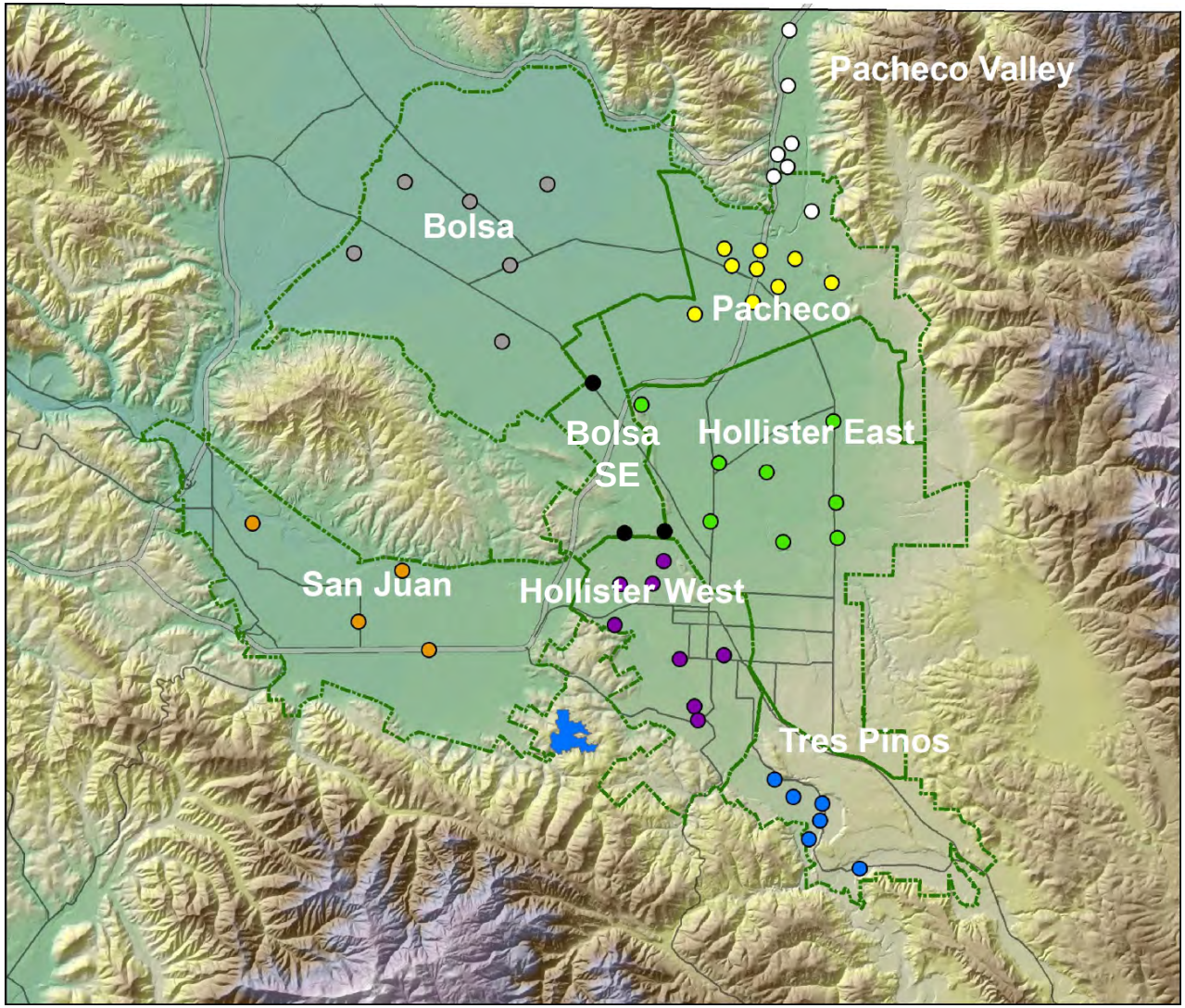

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Figure 3-7
Locations of Key Wells Used in Hydrographs

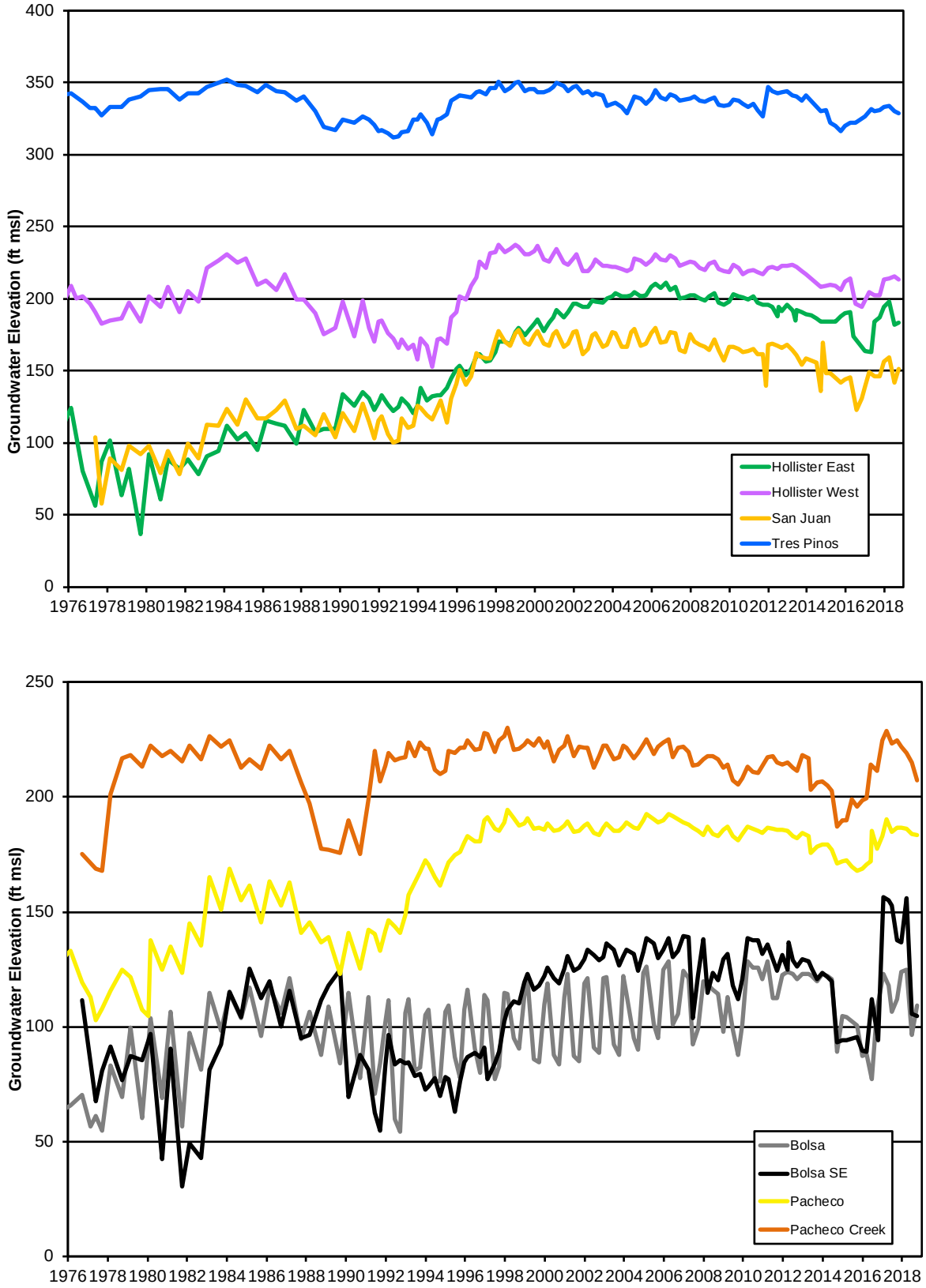

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Figure 3-8
Composite Hydrographs

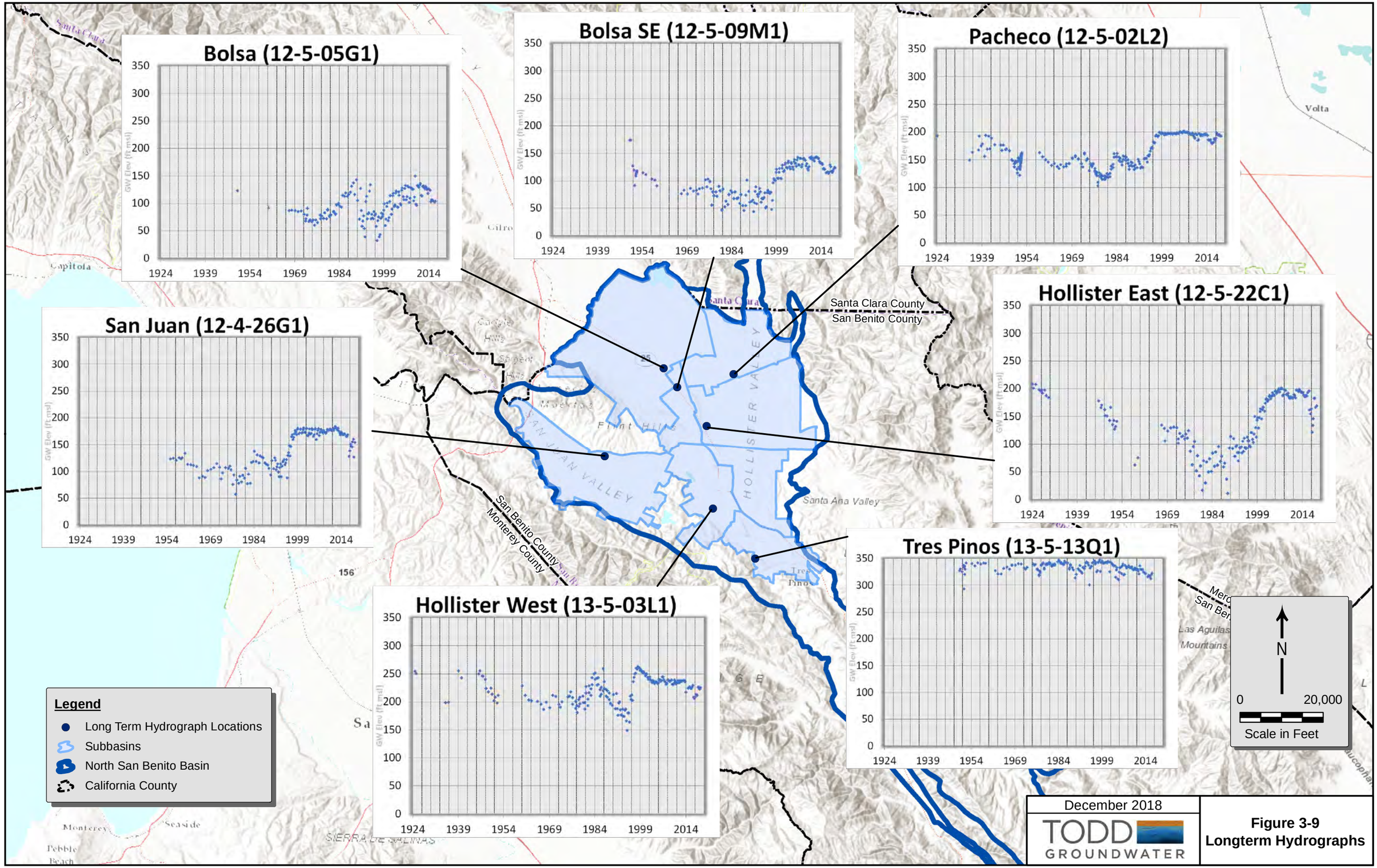


Figure 3-9
Longterm Hydrographs

Water Supply Sources

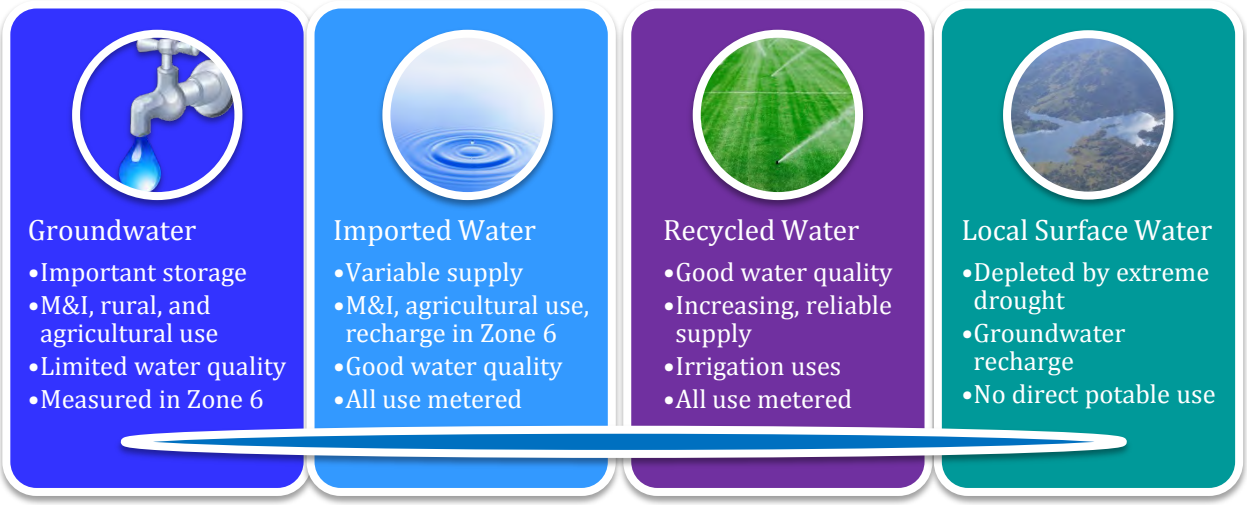
Four major sources of water supply are available for municipal, rural, and agricultural water demands. These are summarized below; for more data and graphs, see **Appendix E.**

Local Groundwater. Groundwater is pumped by private irrigation and domestic wells and by public water supply retailers. The District does not directly produce or sell groundwater but has the responsibility and authority to manage groundwater throughout San Benito County.

Imported Water. The District purchases Central Valley Project (CVP) water from the U.S. Bureau of Reclamation (USBR) and distributes to customers in Zone 6. Some CVP water has also been released for groundwater recharge. The District has a 40-year contract (extending to 2027 and renewable thereafter) for a maximum of 8,250 AFY of M&I water and 35,550 AFY of agricultural water.

Recycled Water. Water recycling began in 2010 with landscape irrigation at Riverside Park. Recycled water currently is provided to selected landscape irrigation and agricultural users. This source is reliable during drought and helps secure a sustainable water supply.

Local Surface Water. Surface water is not used directly for potable or irrigation use in the basin, but creek percolation is a significant source of groundwater recharge. Releases from the District's Hernandez and Paicines reservoirs were below average in 2018, but still contributed to recharge of the groundwater basin. Stormwater capture currently is limited to some diversion by the City of Hollister to the Hollister Industrial WWTP (via a combined sewer system) with subsequent treatment and discharge to percolation and evaporation ponds.



Available Imported Water

The District distributes CVP water to agricultural and M&I customers in Zone 6. The allocation of the contract for each year is potentially quite variable and contingent on total available supply of the CVP system. In dry years, the allocation may be zero and in wet years, it may be 100 percent of the contract amount. The USBR contract years are March through February, so water year 2018 (Oct 2017-Sept 2018) overlapped two contract years. In this water year, the effects of the previous wet year continue to be seen in the allocations for the March 2017-February 2018.

For USBR contract year 2017 (March 2017 - February 2018), both agriculture and M&I customers were provided the full contract allocation, for the first time since 2006. In the current USBR contract year 2018 (March 2018 - February 2019), agriculture customers received 50 percent of their allocation and M&I customers were provided the 75 percent of the allocation. **Table 4-1** shows the contract entitlements and recent allocations (SLDMWA 2017).

Table 4-1. Allocation for USBR Water Years 2017-2018

March 2017 - February 2018			
	Contract Amount	% Allocation	Allocation Volume (AF)
Agriculture	35,550	100%	35,550
M&I	8,250	100%	8,250
TOTAL	43,800		43,800
March 2018 - February 2019			
	Contract Amount	% Allocation	Allocation Volume (AF)
Agriculture	35,550	50%	17,775
M&I	8,250	75%	6,188
TOTAL	43,800		23,963

Water Use

Table 4-2 shows the total water use in Zone 6 by source and user type for water years 2017 and 2018. Total water use increased 27 percent. The increased availability of CVP imported water is reflected in the volume of CVP delivered to agricultural users in both years. As a point of comparison, in 2016 the allocation for agriculture use was a mere 5 percent and the total CVP water delivered to agricultural customers was 3,700 AF. CVP water used for M&I almost doubled in 2018. This year was the first full year of production for the new West Hills Water Treatment Plant (WTP) and newly expanded Lessalt WTP. Both WTPs are designed to treat and deliver CVP water to urban users.

Figure 4-1 shows Zone 6 total water use by source and use over the past 30 years. Overall, the graph indicates that water use has a general declining trend. However, 2018 was marked by a significant increase in the total water use. Both CVP and groundwater demand increased from 2017, by approximately 24 and 30 percent, respectively. **Figure 4-2** illustrates the changing relative proportion of groundwater and CVP supply in Zone 6 (with recycled water after 2010). The graph shows the general increase in CVP water until 2006 and the corresponding decrease in groundwater as a supply. Thereafter, the graph illustrates the variability of CVP supply because of drought and wet years and other restrictions. To be specific, when CVP supply has been reduced, groundwater supply has been available, reflecting conjunctive management. While the total volume of supply was higher in 2018, the relationship between CVP and groundwater remained similar to water year 2017, with CVP accounting for 42 percent and 45 percent for 2018 and 2017 respectively (**Figure 4-2)**. Due to the variability in CVP allocations, the percent of supply satisfied by imported water is also variable. For example, in 2016 only 16 percent of supply was from CVP, and in 2018, CVP supply increased to 42 percent.

Table 4-2. Total Water Use in Zone 6 by User and Water Source 2017-2018

	CVP Water		Groundwater		Recycled Water		Total	
	2017	2018	2017	2018	2017	2018	2017	2018
Agriculture	13,288	14,453	14,727	21,108	258	364	28,273	35,925
M&I	2,909	5,679	5,088	4,748	108	107	8,105	10,533
TOTAL	16,197	20,131	19,815	25,856	366	471	36,378	46,458

Groundwater use for agricultural customers increased by 50 percent from 2017 to 2018. The reasons for the increased use are not specifically known but could be attributed to the cost of CVP water. It could also be that during the drought, growers improved their infrastructure (drilling new wells, installing pipelines, etc.) and continue to use these even as CVP allocations were increased. The largest increase in agricultural groundwater use was in Bolsa South East, but all subbasins except Tres Pinos showed increased groundwater pumping by agricultural use. There was a slight decrease in groundwater use for M&I, largely due to the increase in CVP water available to municipal users. Overall, M&I demand increased 29 percent, possibly reflecting the combined effect of urban growth, decreased public

attentiveness of water conservation measures after the drought, and other factors. Recycled water showed a slight increase as more recycled water has been delivered to agricultural users.

Table 4-3 shows the breakdown of total water use by each subbasin in Zone 6. Consistent with past patterns, San Juan is the largest producer of groundwater and the second largest user of CVP supplies, mainly for agricultural irrigation. Hollister East is the largest user of CVP for both agricultural users and municipal uses. This is the first full year when both water treatment plants have been online to treat CVP water for municipal use.

Table 4-3. Zone 6 Water Use by User and Water Source 2017-2018

	CVP Water		Groundwater		Recycled Water	
Subbasin	Agriculture	Domestic & Municipal	Agriculture	Domestic & Municipal	Agriculture	Domestic & Municipal
Bolsa South East	291	0	3,021	43	3	0
Hollister East	6,190	3,496	3,404	295	0	0
Hollister West	64	1,990	1,912	2,010	361	107
Pacheco	1,456	72	4,207	168	0	0
San Juan	6,310	74	8,258	673	0	0
Tres Pinos	142	47	306	1,559	0	0
TOTAL	**14,453**	**5,679**	**21,108**	**4,748**	**364**	**107**

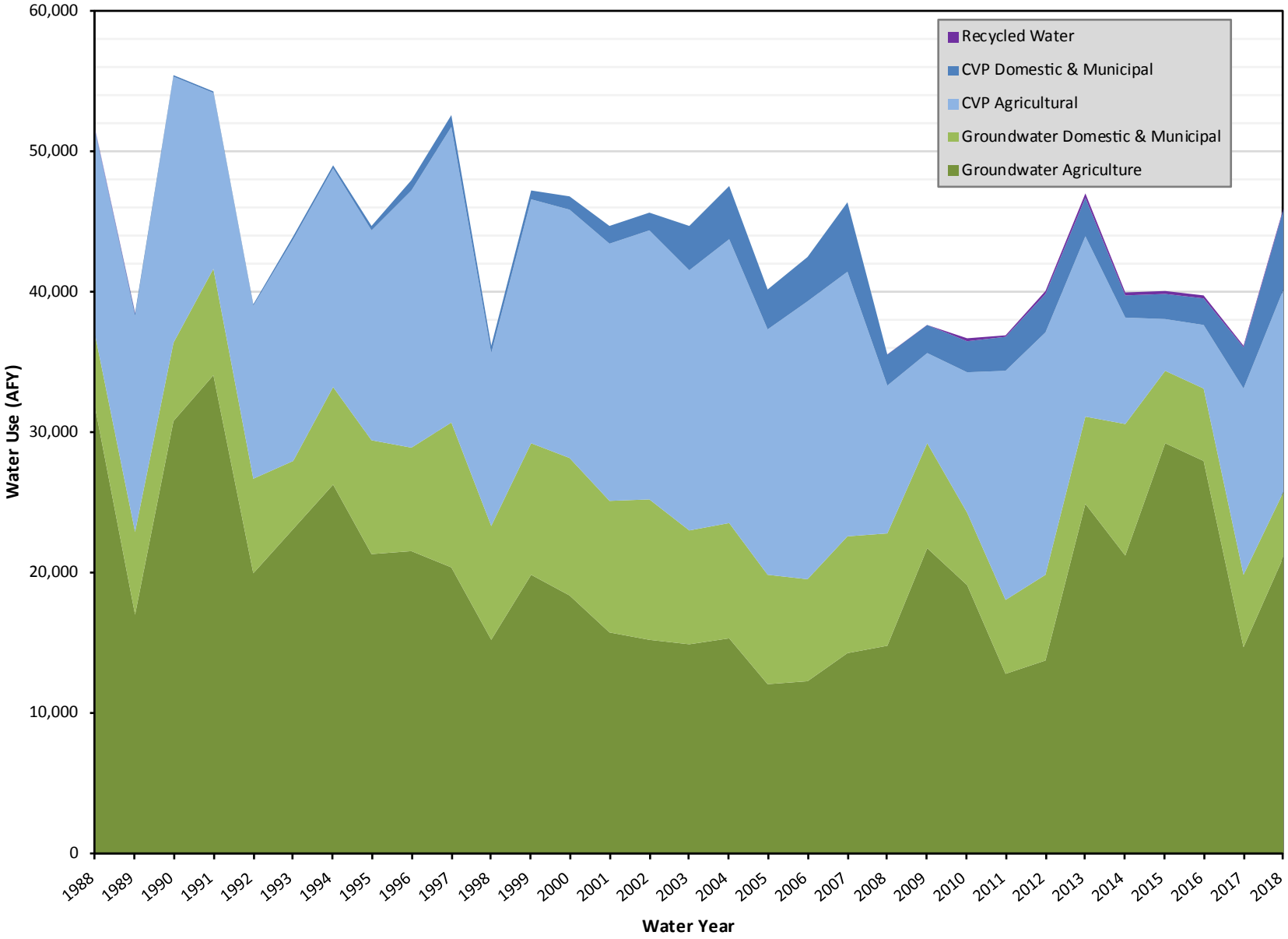
Table 4-4 shows the subbasin areas, total water use, total pumping, and rate of pumping (total pumping over area). This allows a general comparison by area, normalizing for the size of the basin. **Figure 4-3** shows the distribution of pumping by subbasin. While the volume of pumping is highest in San Juan, **Table 4-4** shows that the rate of pumping is also one of the highest, at 0.76 AFY per acre. The table also shows the percent of total supply from groundwater for each subbasin. Bolsa, an area that does not receive CVP water, is 100 percent reliant on groundwater, with Bolsa SE and Tres Pinos also relying on groundwater for 91 percent of total supply.

Table 4-4. Pumping Patterns by Subbasin

Subbasin	Subbasin Area (Acres)	Total Water Use (AFY)	Total Groundwater Use (AFY)	Rate of pumping (AFY/Acre)	% GW
Bolsa SE	2,691	3,358	3,063	1.14	91%
Hollister East	15,860	13,385	3,699	0.23	28%
Hollister West	6,050	6,444	3,922	0.65	61%
Pacheco	6,743	5,904	4,375	0.65	74%
San Juan	11,708	15,315	8,932	0.76	58%
Tres Pinos	4,725	2,053	1,865	0.39	91%
Bolsa*	20,003	6,245	6,245	0.31	100%

*based on 2017 water balance estimate

The percent of subbasin supply met by groundwater can vary widely over time and by subbasin. **Figure 4-4** shows the percent of total subbasin supply provided by groundwater. The trend lines show the same general pattern as **Figure 4-2**, with groundwater supply decreasing until 2006 (as CVP supply increased) and then fluctuating considerably as imported water and groundwater are used conjunctively. The substantial variability in groundwater use (i.e., in Pacheco, San Juan, and Hollister East) indicate significant structural capacity and flexibility for local water users to use groundwater or CVP.



December 2018

TODD GROUNDWATER

Figure 4-1
Total Water Use by Source and Use
Zone 6

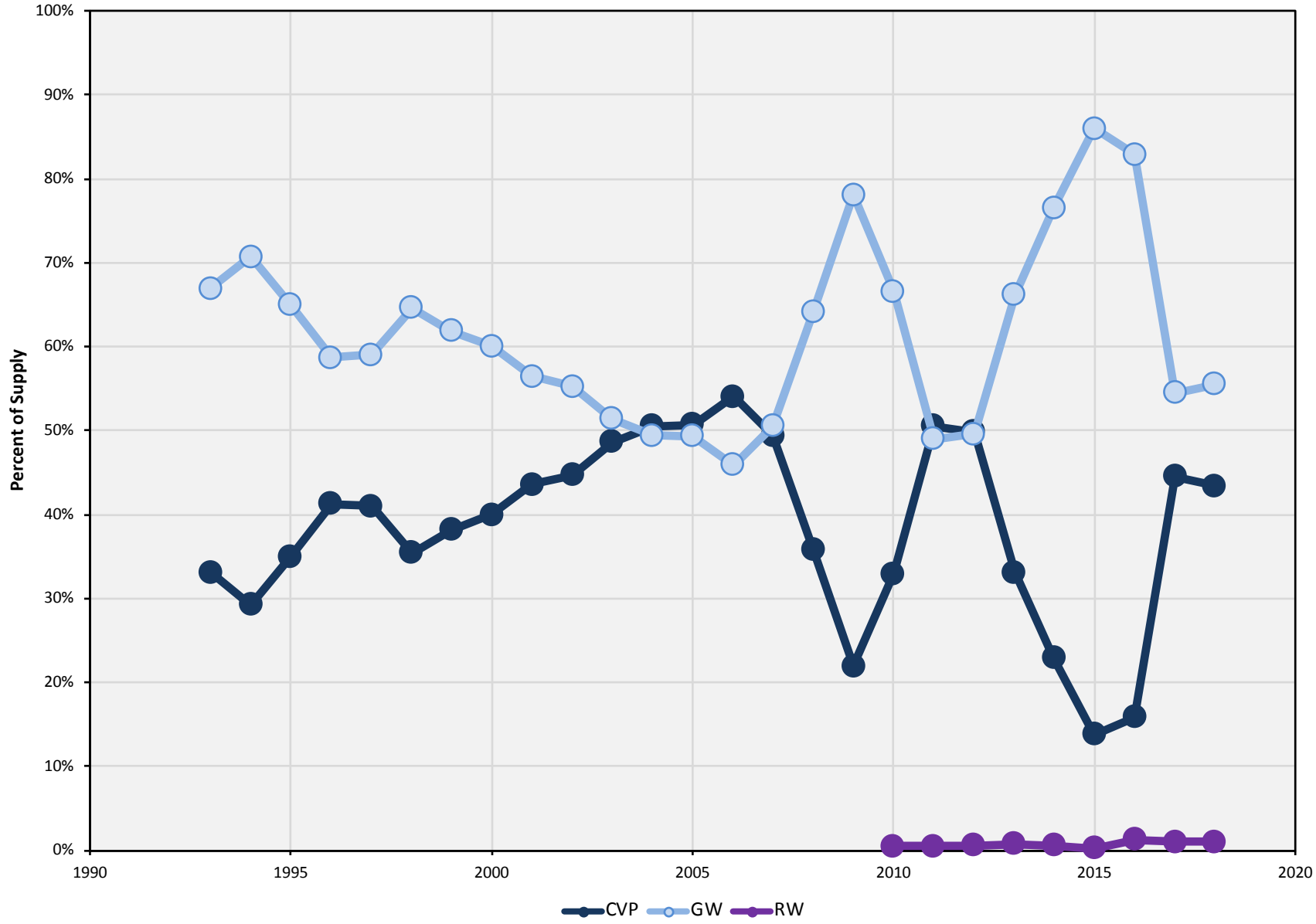


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Figure 4-2
Percent of Supply by Source
Zone 6

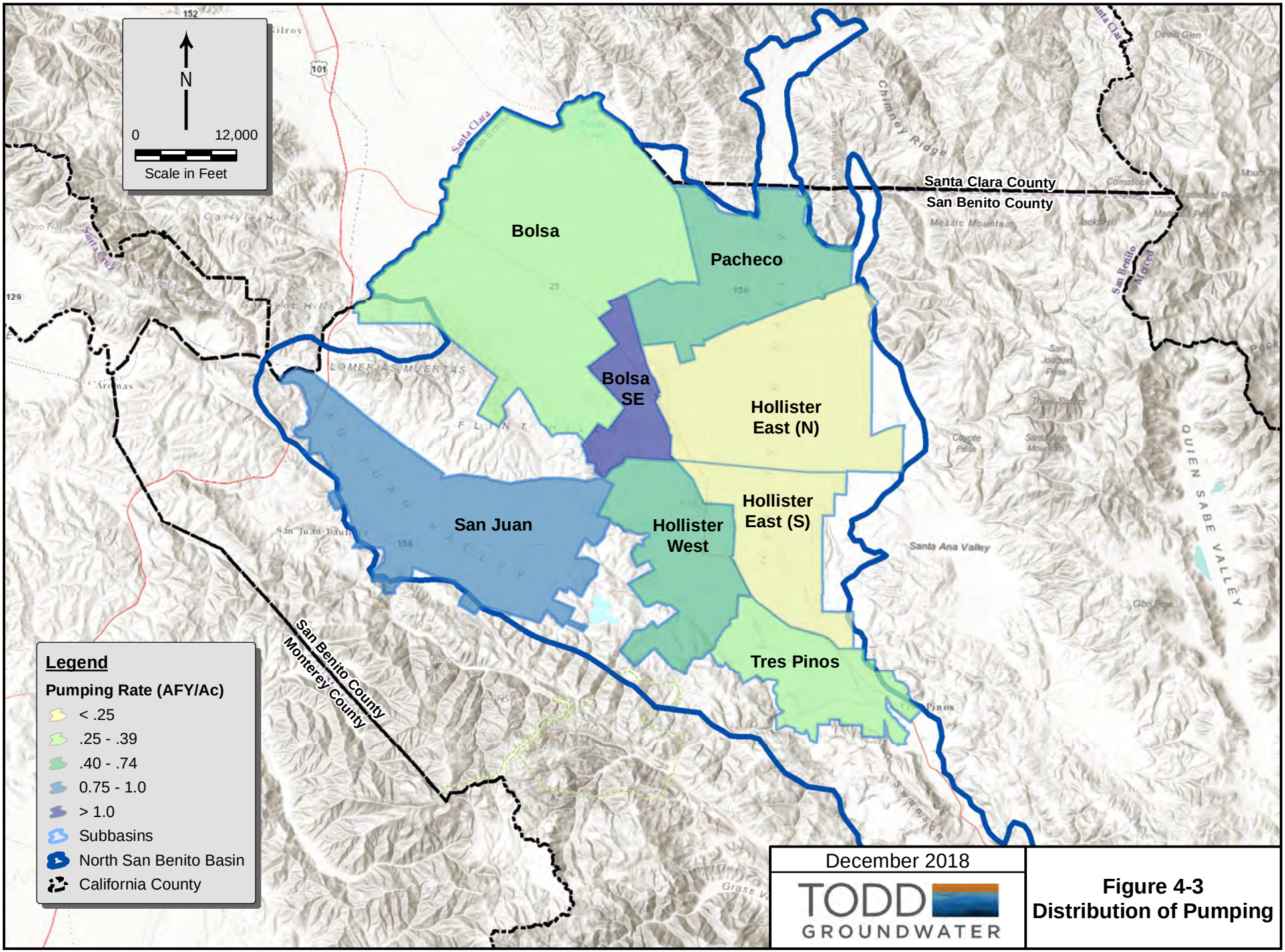

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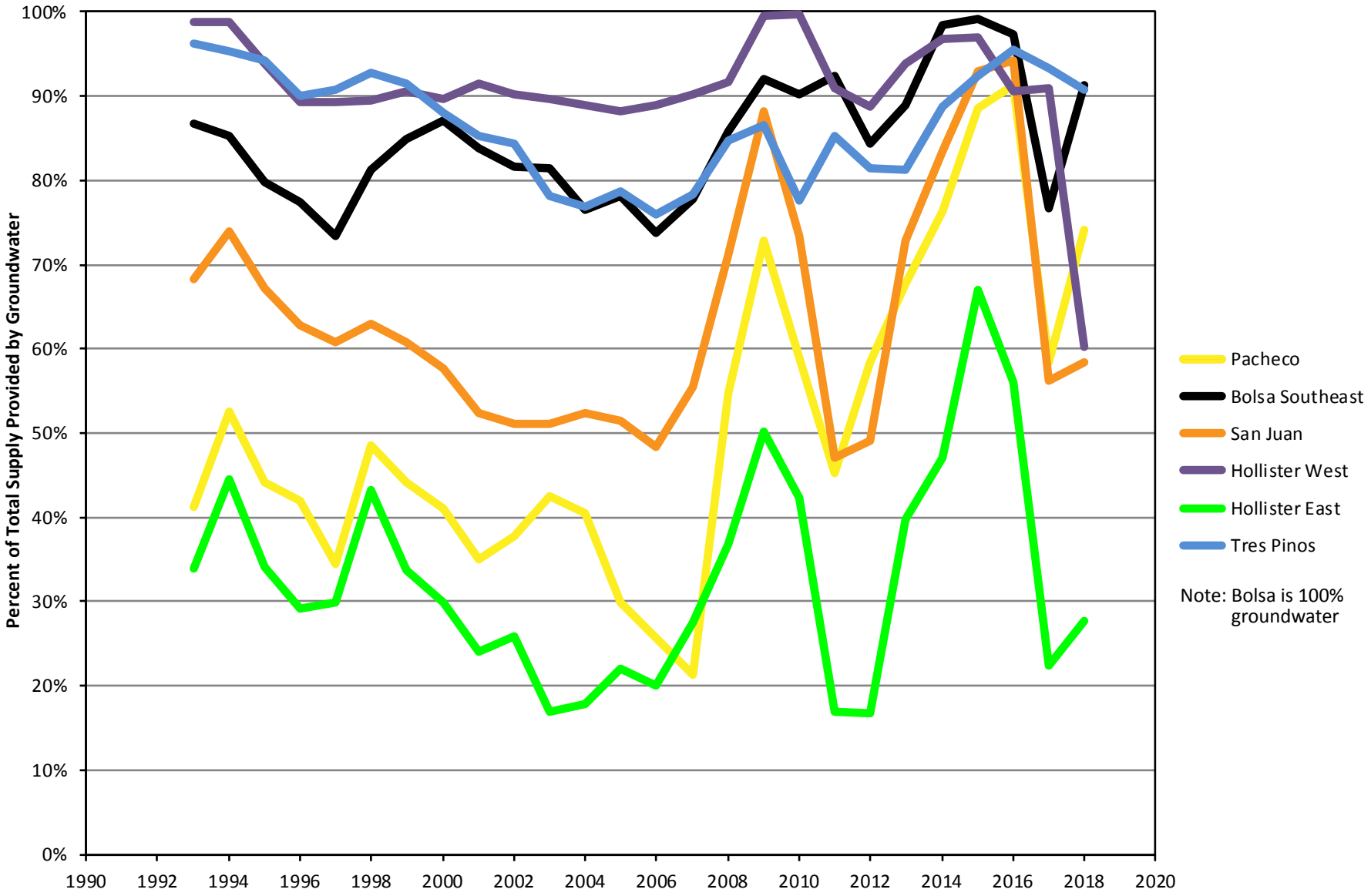
Figure 4-3
Distribution of Pumping



December 2018

TODD GROUNDWATER

Figure 4-4
Percent of Subbasin Supply by Groundwater

5-WATER MANAGEMENT ACTIVITIES

District water management activities include comprehensive monitoring (summarized in Section 2) and importation and distribution of CVP water in Zone 6 (Section 4). In addition, the District provides water resources planning, water conservation support services, and managed percolation of local surface water to augment groundwater; these are summarized in this section. Sources of revenue to support District operations also are presented here.

Water Resources Planning

The District has used multiple planning efforts to support groundwater sustainability. These have included water management plans such as the Groundwater Management Plan (1998 and 2003), Integrated Regional Water Management Plan (2007), Salt and Nutrient Management Plan (2014), Agricultural Water Management Plan (2015), and Urban Water Management Plans (2016). These plans have addressed the full range of groundwater sustainability issues with advancement of conjunctive use of imported water, local surface water, recycled water and groundwater; with water conservation, and with protection of water quality. Current efforts and recent accomplishments are summarized below.

Hollister Urban Area Water Project. This project is an ongoing collaborative effort with local agencies to provide a secure and stable water supply to the region. The project has involved provision of water treatment for CVP water, which allows its direct use for municipal and industrial (M&I) purposes. It also allows delivery of improved quality water to customers. 2018 was the first full year of production for the new West Hills WTP and newly expanded Lessalt WTP. The District also has worked cooperatively for years with the City of Hollister to implement recycled water use primarily for agricultural irrigation, which continued to increase in 2018.

Pacheco Reservoir Expansion Project. In 2018, SCVWD was awarded $484.5 million in funding from the State of California for the Pacheco Reservoir Expansion Project, which is a collaborative effort of SBCWD, SCVWD, and Pacheco Pass Water District. This project would establish a new dam and expanded reservoir on the North Fork of Pacheco Creek in Santa Clara County. The expanded reservoir, with a capacity of 140,000 acre-feet, would allow storage of CVP supplies and local inflows for use by the water districts, provide more flexibility for use of CVP water, enhance the continuity of flows in Pacheco Creek, reduce flood risks downstream, and benefit downstream habitats along Pacheco Creek and the local steelhead population.

Water Conservation

Water conservation is an important tool to manage demands on the groundwater basin, particularly during drought. During the most recent drought, intensified water conservation efforts were successful in reducing water demands to meet State and local goals. Water conservation efforts in San Benito

County are conducted through the Water Resources Association (WRA). WRA is a cooperative effort among the District, City of Hollister, City of San Juan Bautista, and Sunnyslope County Water District.

Activities in 2018 have included provision of information, home surveys, and rebates. To keep the public informed, the WRA has prepared bill inserts that highlight water conservation programs and provide updates on water conditions; the October 2018 bill insert describes SGMA and how it may affect the groundwater users. Provision of information by WRA staff also has included school presentations to over 660 students last year and presentations to local organization such as the Chamber of Commerce and Rotary Club. In addition, print articles promoting water conservation have been published in the Free Lance newspaper and Benito Link.

The Home Water Survey allows the WRA to directly work with customers who have a leak or large water bill. The WRA has been able to reach approximately 400 people a year with this service.

WRA also provides various rebates (toilets, landscape hardware, etc.) The most popular rebate program is the water softener demolishing/replacement program; with provision of CVP supply for municipal use, the delivered water quality has improved, and customers are willing to abandon unneeded water softeners. This program has the benefit of improving the water quality of municipal wastewater and recycled water.

Managed Percolation

Percolation of Local Surface Water. In most years, local surface water released from Hernandez and Paicines reservoirs is percolated along the San Benito River and Tres Pinos Creek. Releases are managed to maximize percolation along the stream channels of the San Benito River and Tres Pinos Creek and to avoid any losses out of the basin. Hernandez Reservoir releases in 2018 were below average (reflecting the below normal rainfall), amounting to 6,054 AF. Releases from Paicines were 384 AF, also below average.

Percolation of Wastewater. Wastewater is percolated by the City of Hollister at its Domestic and Industrial plants, by SSCWD at its Ridgemark Facilities, and by Tres Pinos Water District. Recent changes in operation of the wastewater facilities (including increased water recycling) and decreased municipal water use have decreased the volume percolating to the groundwater. Information about the amount of groundwater recharged from these wastewater facilities is found in **Appendix D**.

Percolation of CVP Water. In Water Year 2018, the District percolated 2,965 AFY of CVP water in offline stream channels in San Juan, Tres Pinos, and Pacheco subbasins; locations are shown in **Figure 5-1.** This amount is slighter higher than the 2,549 AFY percolated in 2017. With carryover water from 2017-18 (100% allocation) and a late allocation of 50% agricultural and 75% municipal and industrial water (2018-19) the District had additional CVP water to percolate that would have otherwise gone unused. Before this recent wet year, the District had not percolated water since the last year with 100 percent allocation (2006-2007).

Financial Information

The District derives its operating revenue from charges levied on landowners and water users. Non-operating revenue is generated from property taxes, interest, standby and availability charges, and grants. District zones of benefit are listed in Appendix A. Zone 6 charges, relating to the importation and distribution of CVP water, are the focus of this section.

Table 5-1 presents the groundwater charges for Zone 6 water users, which reflect costs associated with monitoring and management. A full worksheet of how groundwater charges are determined can be found in **Appendix F**. Groundwater charges are adjusted annually in March. For March 2018 – February 2019, District rates are $7.95 for agricultural use and $24.25 for M&I use. The District is in the process of adopting groundwater rates for the next three years. The proposed rates for March 2019 – February 2020 are subject to Board adoption at a public hearing to be held January 30, 2019.

Table 5-1. Current and Proposed Groundwater Charges

Year	Agriculture	M&I
2018-2019	$7.95	$24.25
2019-2020 (proposed)	$12.75	$38.25

CVP rates (provided by the USBR) include the cost of service, restoration fund payment, charges for maintenance of San Luis Delta Mendota Water Authority facilities, and other fees (the breakdown is found in **Appendix F**). The District's blue valve rates (paid by users of CVP water) include a water charge and a power charge. Additionally, the standby and availability charge is a $6 per-acre charge assessed on all parcels with access to CVP water (an active or idle turnout from the distribution system). The 2019-2020 proposed CVP water charges, like the groundwater charges, are subject to Board adoption at a public Hearing to be held January 30, 2019. **Table 5-2** shows the CVP water charge and **Table 5-3** shows the CVP power charge.

Table 5-2. Current and Proposed Blue Valve Water Charges

Blue Valve Water Charge ($/AF)				
	Agricultural			
Year	Non - Full Cost	Full Cost (1a)	Full Cost (1b)	Municipal & Industrial
2018-2019	$209.00	$382.00	$400.00	$363.00
2019-2020 (proposed)	$254.00	$386.00	$407.00	$379.00

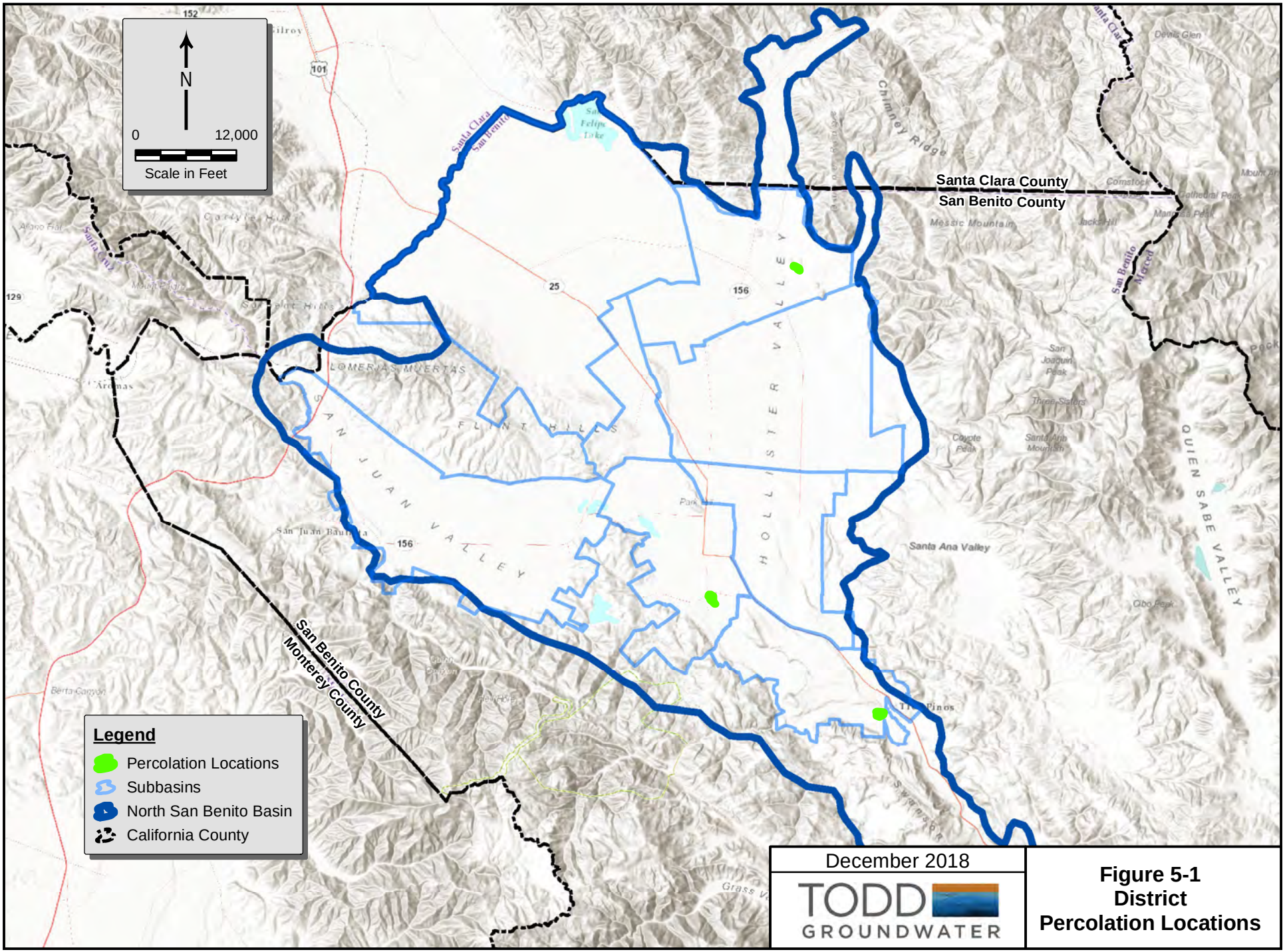
Table 5-3. Current and Proposed Blue Valve Power Charges

Blue Valve Power Charge ($/acre-foot)	Subsystem 2	Subsystem 6H	Subsystem 9L	Subsystem 9H	All other subsystems
2018-2019	$130.60	$80.25	$116.65	$172.45	$70.10
2019-2020 (proposed)	$68.00	$37.10	$73.80	$105.40	$33.00

Recycled water charges (**Table 5-4**) are set to recover current operating and maintenance costs related to the water service. Recycled water rates include those associated with water supply, water quality, and infrastructure.

Table 5-4. Current Recycled Water Charges

	Recycled Water	
Effective	Agriculture Rate	Power Charge
Mar-17	$183.45	$59.45
Mar-18	$183.45	$59.45



December 2018

TODD GROUNDWATER

Figure 5-1
District
Percolation Locations

6-GROUNDWATER SUSTAINABILITY

Sustainable Groundwater Management Act (SGMA)

The Sustainable Groundwater Management Act (SGMA) requires sustainable management of priority groundwater basins and empowers local Groundwater Sustainability Agencies (GSAs) to manage groundwater resources in a sustainable manner. San Benito County Water District GSA (SBCWD GSA), in partnership with Santa Clara Valley Water District GSA (SCVWD GSA) for the small portions of the basin in Santa Clara County, is developing a Groundwater Sustainability Plan (GSP) for the North San Benito Basin, which encompasses the historically-defined Bolsa, Hollister, and San Juan Bautista Subbasins of the Gilroy-Hollister Basin and the Tres Pinos Valley Basin. This GSP is being funded in part with a $830,000 grant from the California Department of Water Resources (DWR) and with GSA cost sharing.

Figure 2-2 shows the GSP area, which is mostly in San Benito County with small portions extending into Santa Clara County. The groundwater subbasin area highlighted in Figure 2-2 has been managed and monitored by SBCWD for decades, although the definition of basin boundaries and the focus of various studies have differed over the years. In 2018, recognizing that the basins are contiguous, hydraulically connected, and comprehensively managed, SBCWD requested DWR to consolidate the four basins into a single basin, termed the North San Benito Groundwater Basin. This consolidation allows preparation of a single, comprehensive GSP.

Groundwater Sustainability Plan Development

GSP development in the North San Benito Basin is based on a strategy to:

- Build on existing monitoring, management, and reporting
- Extend existing monitoring, management, and reporting to DWR-defined basin boundaries
- Update and refine existing plans, programs, and management tools to address SGMA criteria
- Comply with SGMA requirements and preserve local control of groundwater management.

DWR has defined comprehensive and detailed requirements for development of GSPs, but also recognizes and supports local control of groundwater management. Hence, the GSP being developed for North San Benito County is building on decades of local monitoring and management, while complying with DWR regulations and recognizing future challenges such as increasing uncertainty of limited imported water supplies and growing demand for local supplies. Consistent with the intent of local control, the GSP also is being developed with engagement of local groundwater users, agencies, stakeholders, and the public. This community engagement, sustained throughout the GSP process, supports the effectiveness, credibility, and acceptance of the GSP.

Figure 6-1 illustrates the major steps toward development of the GSP within the context of community engagement and with reference to an approximate timeframe. These steps will be documented in a series of deliverables—including GSP sections, memoranda, and technical reports—that will be compiled into the draft and final GSP. The GSP process, initiated in June 2018, will be completed in late 2021, meeting the deadline of January 31, 2022 for GSP completion, adoption by the GSAs, and submittal to DWR. While adoption and approval are the culmination of initial GSP development, the GSP process continues in the future with implementation of management activities, preparation of Annual Reports, and GSP updates every five years; this is intended to be an ongoing, adaptive process.

Figure 6-1. Major Steps in GSP Development

The major technical steps in developing the initial GSP are as follows:

Plan Area/Institutional Setting. The first step in developing the GSP is description of the Plan Area and the institutional setting. This is accomplished in the first two sections of the GSP document: Introduction and Plan Area. The *Introduction* presents the North San Benito Basin and the authority of the GSAs to prepare a GSP. The *Plan Area* section provides basic information on the North San Benito Basin including its physical boundaries, jurisdictions of water and land use planning agencies, water sources and water use sectors, existing monitoring and management, land use planning, and well permitting.

The Introduction also will summarize the estimated cost of GSP implementation and the means of funding GSP implementation, when this information is developed later in the GSP process. SBCWD has existing funding sources (e.g., through Zones 3 and 6); however, GSP implementation (monitoring, management, and reporting) is likely to be more intensive than ever before (because of increasing water

demand and uncertainties) and is required for the entire North San Benito Basin. Accordingly, the GSP process will include evaluation of a fiscal structure to fund implementation fairly across the Basin. This evaluation will account for estimated ongoing costs of GSP monitoring and management in the context of current funding sources. This funding evaluation is scheduled to begin in early 2020.

Data Compilation/Data Management System. SBCWD has an annual program of collecting and compiling groundwater data into a data management system (DMS) that includes groundwater elevation, water quality, and water use data for the Annual Groundwater Reports. The effort for the GSP will be to review and update the DMS, to identify data gaps, and to support the GSP monitoring program. Available information will support the entire GSP including analysis of the hydrologic setting, groundwater conditions, sustainability criteria, and potential projects and management actions.

Hydrogeologic Conceptual Model/Groundwater Conditions. The third major step includes development of the hydrogeologic conceptual model (HCM), which is a description of the structural and physical characteristics that govern groundwater occurrence, flow, storage, and quality. These characteristics—described in text, tables, maps, and cross-sections—include regional geology, soils, geologic structures (such as faults) and boundaries (including bottom of the basin), aquifer properties. This step also includes documentation of historical and current groundwater conditions. This includes groundwater levels and flow, groundwater quality, land subsidence, and interactions of groundwater and surface water. In brief, this step describes how the local surface water-groundwater system works. It also will be an important basis for definition of *management areas*, involving subdivision of the North San Benito Basin to facilitate sustainable groundwater management.

Water Budgets. In the fourth major step, water budgets will be quantified for historical and current conditions. This will involve use of past studies, the existing numerical model, and recent monitoring data and investigations. Water balances developed by SCVWD for the adjacent Llagas Basin also will be reviewed to promote a consistent approach. The GSP Water Budgets will build on past Annual Report water balances and include use of available data and best available science to quantify inflows, outflows, and change in storage, including sustainable yield and potential overdraft. As shown here, this step includes numerical modeling that will be used to explore how the groundwater systems works, to assess potential management actions and projects, and to demonstrate how a GSP will achieve sustainable basin operation. SBCWD has a numerical model (Yates, 2001) that will be updated, expanded to cover the entire basin, and improved for application in the GSP.

Sustainability Criteria. While SBCWD has a long history of groundwater management, such management has not included systematic quantification of undesirable results, minimum thresholds, or measurable objectives to the extent required by SGMA. The fifth step of the GSP process will address the five undesirable results/sustainability indicators relevant to North San Benito Basin and indicated by the icons below. These include: chronic lowering of groundwater levels, groundwater storage depletion, water quality degradation, land subsidence, and depletion of interconnected surface water. Each of these will be defined in terms of minimum thresholds where occurrence of an undesirable result becomes significant and unreasonable and in terms of measurable management objectives.

Management Actions/Monitoring. In the sixth step, the GSP will present management actions—policies, programs, and projects—that will address the sustainability criteria and provide for sustainable management into the future. This step also will establish the GSP monitoring network and protocols that: 1) provides data to inform the hydrogeologic conceptual model, water budget and numerical model, 2) provides tracking and early warning regarding groundwater conditions and undesirable results, and 3) demonstrates progress toward and achievement of sustainability.

Plan Development. The GSP preparation process will culminate with development of GSP document including GSP sections with text, tables, and graphics plus appendices. The GSP document will be provided on the SBCWD website as a draft; following a comment period, a final GSP document will be presented for GSA consideration and adoption.

Technical Advisory Committee (TAC)

As suggested by the technical steps described above, development of an effective and credible GSP is a multi-disciplinary process that combines engineering, science, and planning with local stakeholder interests and community values. To help guide this process, a Technical Advisory Committee (TAC) was organized in 2018. The purpose of the TAC is to incorporate community and stakeholder interests into consensus recommendations on SGMA implementation for consideration by the GSA Board in its decision-making process. The TAC members are responsible for reviewing draft products and materials and providing recommendations to support a technically sound GSP. Members of the TAC have been selected to represent GSP-related subject areas, including but not limited to environmental, technical, and land use planning fields. The TAC members began their quarterly meetings in August 2018 and are working collaboratively with SBCWD GSA staff and consultants. TAC meetings are open to the public.

Community Engagement

The GSP process seeks to engage the diverse public, stakeholders, and groundwater interests. This will be accomplished with provision of information materials (e.g., posters and fact sheets), public workshops and other meetings, media (e.g., press releases) and the District website, and other outreach opportunities (e.g., fairs and festivals). In 2018, the following were accomplished:

- SGMA section on the redesigned SBCWD website: http://scbwd.com that provides information, announcements, and access to draft GSP documents
- Community Engagement Plan, poster, and three fact sheets addressing SGMA, the GSP process, and existing water management
- Two TAC meetings (August 15 and November 7), open to the public
- First Public Workshop (November 14) in Hollister, which provided an overview of SGMA and the GSP process and a forum for discussion of groundwater conditions, concerns, and challenges.

7-RECOMMENDATIONS

District policies and programs have served to effectively manage water resources for many years. The District, working collaboratively with other agencies, has eliminated historical overdraft through importation of CVP water, has developed and managed multiple sources of supply to address drought, has established an active and effective water conservation program, has initiated programs to protect water quality, and has improved delivered water quality to many municipal customers. The District also has provided consistent reporting and outreach. The following recommendations are responsive to the District Act and look forward to continuing effective management consistent with SGMA.

Monitoring Programs

The District monitoring programs should be expanded to the entire North San Benito Groundwater Basin and improved to ensure accurate and consistent data for the Annual Reports and for GSP development.

- A high-priority task is to update and expand the groundwater level and quality monitoring network as discussed in the District November 21, 2018 technical memorandum.
- CIMIS station #126, maintained by the District, provides important data on increasingly variable climate conditions. However, the rain gage data have been compromised by spray irrigation. The irrigation system and practices need to be corrected to ensure that the CIMIS rain gage (part of a state-wide network) collects only precipitation.

Groundwater Charges

The groundwater charge for the USBR contract year (March 2019-February 2020) is recommended to be $12.75 for agricultural use in Zone 6 and a groundwater charge of $38.25 is recommended for M&I use in Zone 6, subject to Board approval at the Public Hearing January 30, 2019.

Groundwater Production and Replenishment

Past District percolation operations helped to reverse historical overdraft and then accumulate a water supply reserve. The District currently manages groundwater storage and surface water to minimize excessively high or low groundwater elevations on a temporal and geographic basis. The District should continue to operate Hernandez and Paicines to improve downstream groundwater conditions, including completion of the implementation and calibration of the new operations planning tool. In 2018, the District provided off-channel percolation of CVP water; this too should be continued given availability of CVP water and persistence of local low groundwater levels. Given the decreased reliability of imported supplies and continuing threat of drought, such replenishment operations are critical to sustainable groundwater supply.

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Table A-2. Special Topics in Previous Annual Reports

APPENDIX A REPORTING REQUIREMENTS

The San Benito County Water District Act (1953) is codified in California Water Code Appendix 70. Section 70-7.6 authorizes the District Board of Directors to require the District to prepare an annual groundwater report; this report addresses groundwater conditions of the District and its zones of benefit for the water year, which begins October 1 of the preceding calendar year and ends September 30 of the current calendar year. The Board has consistently ordered preparation of Annual Reports, and the reports have included the contents specified Section 70-7.6:

- An estimate of the annual overdraft for the current water year and for the ensuing water year
- Information for the consideration of the Board in its determination of the annual overdraft and accumulated overdraft as of September 30 of the current year
- A report as to the total production of water from the groundwater supplies of the District and its zones as of September 30 of the current year
- Information for the consideration of the Board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the District and its zones
- The amount of water the District is obligated to purchase during the ensuing water year
- A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the District and its zones during the ensuing water year
- A recommendation as to whether or not a groundwater charge should be levied in any zone(s) of the District in the ensuing water year and if so, a rate per acre-foot for all water other than agricultural water for such zone(s)
- Any other information the Board requires.
- The full text of Appendix 70, Section 70-7.6 through 7.8 is enclosed at the end of this appendix.
- Each water year a special topic is identified for further consideration. These topics have included water quality, salt loading, shallow wells, and others. Additional analyses and documentation provided in previous annual reports are summarized in the following table.

District management of water resources is focused on three Zones of Benefit, listed below.

Table A-1. District Zones of Benefit

Zone	Area	Provides
1	Entire County	Specific District administrative expenses
3	San Benito River Valley (Paicines to San Juan) and Tres Pinos River Valley (Paicines to San Benito River)	Operation of Hernandez and Paicines reservoirs and related groundwater recharge and management activities
6	San Juan, Hollister East, Hollister West, Pacheco, Bolsa SE, and Tres Pinos subbasins	Importation and distribution of CVP water and related groundwater management activities

Table A-2. Special Topics in Previous Annual Reports

Water Year	Additional Analyses and Reporting
2000	Methodology to calculate water supply benefits of Zone 3 and 6 operations
2001	Preliminary salt balance
2002	Investigation of individual salt loading sources
2003	Documentation of nitrate in supply wells, drains, monitor wells, San Juan Creek
2004	Documentation of depth to groundwater in shallow wells
2005	Tabulation of waste discharger permit conditions and recent water quality monitoring results
2006	Rate study
2007	Water quality update
2008	Water budget update
2009	Water demand and supply
2010	Water quality update
2011	Water budget update
2012	Land use update
2013	Water quality update
2014	Water balance update and Groundwater Sustainability
2015	Groundwater Sustainability – Basin Boundaries and GSAs
2016	Water quality update
2017	Water budget update
2018	GSP Update

APPENDIX A REPORTING REQUIREMENTS

Water Code Appendix 70 Excerpts

Section 70-7.6. Groundwater; investigation and report: recommendations San Benito County

Sec. 7.6. the board by resolution require the district to annually prepare an investigation and report on groundwater conditions of the district and the zones thereof, for the period from October 1 of the preceding calendar year through September 30 of the current year and on activities of the district for protection and augmentation of the water supplies of the district and the zones thereof. The investigation and report shall include all of the following information:

(a) Information for the consideration of the board in its determination of the annual overdraft.

(b) Information for the consideration of the board in its determination of the accumulated overdraft as of September 30 of the current calendar year.

(c) A report as to the total production of water from the groundwater supplies of the district and the zones thereof as of September 30 of the current calendar year.

(d) An estimate of the annual overdraft for the current water year and for the ensuing water year.

(e) Information for the consideration of the board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the district and the zones thereof for the ensuing water year.

(f) The amount of water the district is obligated to purchase during the ensuing water year.

(g) A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the district and the zones thereof the ensuing water year.

(h) A recommendation as to whether or not a groundwater charge should be levied in any zone or zones of the district during the ensuing year.

(i) If any groundwater charge is recommended, a proposal of a rate per acre-foot for agricultural water and a rate per acre-foot for all water other than agricultural water for such zone or zones.

(j) Any other information the board requires.

(Added by Stats. 1965, c. 1798, p.4167, 7. Amended by Stats.1967,c.934, 5, eff. July27,1967; Stats. 1983, c. 402, 1; Stats. 1998, c. 219 (A.B.2135), 1.)

Section 70-7.7. Receipt of report; notice of hearing; contents; hearing

Sec. 7.7. (a) On the third Monday in December of each year, the groundwater report shall be delivered to the clerk of the board in writing. The clerk shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of a public hearing to be held on the second Monday of January of the following year in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding the groundwater report shall be held. The notice shall include, but is not limited to, an invitation to all operators of water producing facilities within the district to call at the offices of the district to examine the groundwater report.

(b) The board shall hold, on the second Monday of January of each year, a public hearing, at which time any operator of a water-producing facility within the district, or any person interested in the condition of the groundwater supplies or the surface water supplies of the district, may in person, or by representative, appear and submit evidence concerning the groundwater conditions and the surface water supplies of the district. Appearances also may be made supporting or protesting the written groundwater report, including, but not limited to, the engineer's recommended groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4167, 8. Amended by Stats. 1983, c. 02,2; Stats. 1998, c. 219 (A.B.2135,2.)

Section 70-7.8. Determination of groundwater charge; establishment of rates; zones; maximum charge; clerical errors

Sec. 7.8. (a) Prior to the end of the water year in which a hearing is held pursuant to subdivision (b) of Section 7.7, the board shall hold a public hearing, noticed pursuant to Section 6061 of the government Code, to determine if a groundwater charge should be levied, it shall levy, assess, and affix such a charge or charges against all persons operating groundwater- producing facilities within the zone or zones during the ensuing water year. The charge shall be computed at fixed and uniform rate per acre-foot for agricultural water, and at a fixed and uniform rate per acre-foot for all water other than agricultural water. Different rates may be established in different zones. However, in each zone, the rate for agricultural water shall be fixed and uniform and the rate for water other than agricultural water shall be fixed and uniform. The rate for agricultural water shall not exceed one-third of the rate for all water other than agricultural water.

(b) The groundwater charge in any year shall not exceed the costs reasonably borne by the district in the period of the charge in providing the water supply service authorized by this act in the district or a zone or zones thereof.

(c) Any groundwater charge levied pursuant to this section shall be in addition to any general tax or assessment levied within the district or any zone or zones thereof.

(d) Clerical errors occurring or appearing in the name of any person or in the description of the water-producing facility where the production of water there from is otherwise properly charged, or in the making or extension of any charge upon the records which do not affect the substantial rights of the assesse or assesses, shall not invalidate the groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4168, 9. Amended by Stats. 1983, c. 402, 3; Stats.1983, c. 402, 3; Stats. 1998, c. 219 (A.B.2135), 3.)

APPENDIX B CLIMATE DATA

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Table B-2. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Table B-1. Monthly Precipitation at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	0.1	0	2.2	4.4	4.5	1.6	1.3	1.3	0	0	0	0	**15.5**	**120%**
1997	1.0	3.2	4.3	6.8	0.2	0.1	0.2	0	0.1	0	0	0	**15.9**	**123%**
1998	0.2	3.8	2.6	4.9	9.1	2.7	2.3	2.4	0.1	0	0	0.1	**28.1**	**218%**
1999	0.5	1.9	0.8	2.5	2.5	1.5	0.7	0.1	0.1	0	0	0	**10.6**	**82%**
2000	0.1	1.0	0.1	4.1	4.5	0.7	0.4	0.5	0.1	0	0	0	**11.5**	**89%**
2001	3.5	0.8	0.2	2.9	2.8	0.6	2.2	0	0	0	0	0	**13.1**	**101%**
2002	0.7	11.5	11.9	0.7	1.2	1.6	0.4	0.3	0	0	0	0	**28.1**	**218%**
2003	0.0	1.7	5.0	0.8	1.4	1.1	3.1	0.1	0	0	0.1	0	**13.1**	**102%**
2004	0.2	0.6	5.3	1.3	4.2	0.6	0.3	0.1	0	0	0	0	**12.5**	**97%**
2005	2.0	0.5	3.5	2.5	2.9	3.4	0.8	0.6	0.4	0	0	0	**16.7**	**129%**
2006	0.1	0.3	3.1	1.5	1.0	5.0	1.7	0.4	0	0	0	0	**13.0**	**101%**
2007	0.2	0.7	1.7	0.6	2.2	0.3	0.6	0	0	0	0	0.4	**6.7**	**52%**
2008	0.7	0.7	0.9	4.6	2.1	0.1	0.1	0	0	0	0	0	**9.1**	**70%**
2009	0.3	1.1	1.9	0.4	3.7	1.8	0.2	0.5	0	0	0	0.2	**10.0**	**77%**
2010	0.5	0	1.3	2.3	2.2	1.7	3.4	0.6	0	0	0	0	**12.1**	**94%**
2011	0.7	1.9	2.6	1.6	2.6	2.3	0.2	0.8	0	0	0	0	**13.0**	**100%**
2012	0.7	1.0	0.1	0.8	0.5	2.3	1.4	0.3	0	0	0	0	**7.1**	**55%**
2013	0.0	2.2	1.2	1.4	0.6	0.5	0.3	0.0	0	0	0	0	**6.3**	**49%**
2014	0.1	0.4	0.2	0.2	1.9	1.6	0.9	0.0	0	0	0	0	**5.4**	**41%**
2015	1.6	0.5	5.8	0.0	1.2	0.2	0.2	0.9	0.0	0.0	0.1	0.1	**10.6**	**82%**
2016	0.2	3.7	1.6	4.0	0.6	3.7	0.8	0.1	0.1	0.1	0.1	0.1	**14.9**	**115%**
2017	1.8	2.5	3.3	4.7	6.1	1.7	1.1	0.5	0.3	0.0	0.0	0.0	**21.9**	**170%**
2018	0.2	1.1	0.2	2.4	0.3	2.7	1.3	0.0	0.0	0.0	0.0	0.0	**8.3**	**64%**
AVG	**0.6**	**1.5**	**2.2**	**2.6**	**2.3**	**2.1**	**1.0**	**0.4**	**0.1**	**0.0**	**0.0**	**0.2**	**12.9**	**102%**

Note: The average precipitation is based on the period of record (1875-2018).

-The CIMIS value for September 2017 (2.4") includes measurement error due to irrigation overspray. The corrected District value is 0".

-The CIMIS value for February, May, June, and August 2018 (0.8", 2.6", 0.1", 0.03") includes measurement error due to irrigation overspray. The corrected District value is 0.3" for February and 0" for all other months.

-Previous years of CIMIS data may have also been affected by irrigation overspray - the data before 2017 have not been corrected.

Table B-2. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	3.9	2.2	1.2	1.5	1.9	3.7	5.1	6.1	6.7	7.4	6.7	4.7	**51.0**	**104%**
1997	3.8	1.8	1.4	1.4	2.5	4.3	5.8	7.5	7.1	7.2	6.7	5.7	**55.2**	**113%**
1998	3.9	1.8	1.5	1.3	1.4	2.8	4.3	4.5	5.3	6.9	6.8	4.7	**45.2**	**92%**
1999	3.5	1.7	1.5	1.5	1.8	3.0	4.7	5.8	6.7	6.9	5.9	4.7	**47.8**	**98%**
2000	4.0	2.0	1.9	1.2	1.6	3.7	5.1	6.0	6.7	6.7	6.2	4.7	**50.0**	**102%**
2001	2.9	1.7	1.5	1.5	1.8	3.1	3.9	6.2	6.5	6.0	6.2	4.8	**46.0**	**94%**
2002	3.5	1.9	1.2	1.5	2.3	3.7	4.2	6.4	7.1	7.2	6.1	5.4	**50.5**	**103%**
2003	3.6	1.9	1.3	1.6	1.8	3.9	3.8	6.0	6.5	7.3	6.2	5.1	**48.8**	**100%**
2004	4.1	1.7	1.2	1.3	1.7	4.0	5.2	6.4	6.7	6.6	6.0	5.3	**50.3**	**103%**
2005	3.1	1.7	1.4	1.3	1.7	3.0	4.4	5.7	6.4	6.9	6.1	4.6	**46.2**	**94%**
2006	3.6	2.0	1.2	1.4	2.2	2.4	3.0	5.5	6.4	7.0	5.6	4.4	**44.7**	**91%**
2007	3.3	1.7	1.4	1.8	1.8	4.1	4.8	6.3	6.9	6.8	6.5	4.7	**49.8**	**102%**
2008	3.5	2.2	1.4	1.3	2.0	3.8	5.2	6.0	6.9	6.7	6.3	5.0	**50.2**	**103%**
2009	3.8	1.9	1.4	1.7	1.7	3.5	4.8	5.5	6.3	7.1	6.3	5.3	**49.3**	**101%**
2010	3.5	2.2	1.7	1.3	1.8	3.5	3.9	5.4	6.7	6.3	5.9	5.0	**47.0**	**96%**
2011	3.0	1.9	1.1	1.6	2.1	2.7	4.4	5.3	6.0	6.6	5.7	4.6	**45.0**	**92%**
2012	3.3	1.9	1.8	1.8	2.5	3.3	4.4	6.4	6.8	6.6	6.0	4.6	**49.5**	**101%**
2013	3.3	1.8	1.2	1.5	2.1	3.7	5.4	6.3	6.4	6.5	6.0	4.8	**48.8**	**100%**
2014	3.5	2.0	1.8	2.1	1.9	3.6	4.9	6.8	6.6	6.4	6.0	4.7	**50.4**	**103%**
2015	3.9	1.9	1.5	1.8	2.2	4.1	5.1	5.0	6.4	6.5	6.5	5.3	**50.2**	**102%**
2016	4.1	2.1	1.4	1.3	2.7	3.4	4.7	5.7	7.5	7.2	5.7	5.2	**51.0**	**104%**
2017	3.4	2.1	1.5	1.6	1.8	3.7	4.5	6.3	6.8	7.6	6.0	5.2	**50.4**	**103%**
2018	4.2	1.9	2.0	1.6	2.7	3.3	4.8	5.8	7.3	7.7	6.6	5.2	**52.9**	**108%**
AVG	3.6	1.9	1.4	1.5	2.0	3.5	4.6	6.0	6.6	6.8	6.2	4.9	**49.0**	**100%**

Note: The averages are for the available period of record, 1995 for reference evapotranspiration.

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Other Documents

Memorandum from SBCWD November 21, 2018.

Table C-1. Groundwater Elevations October 2017 through October 2018

Well Number	Well Depth (feet)	Depth to Top of Screens (feet)	Subbasin	Key Well	Groundwater Elevations (feet MSL)				
					Oct-17	Jan-18	Apr-18	Jul-18	Oct-18
Bolsa SE									
12-5-09M1	240.00	105.00	BSE	*	115.6	118.4	121.6	124.3	123.7
12-5-21Q1	500.00	0.00	BSE	*	260.0	260.0	260.0		
12-5-22N1	372.00	250.00	BSE	*	77.7	84.6	86.9	86.9	85.6
Hollister East									
2317	0.00	0.00	HE		221.5	224.1	224.2	223.8	222.7
12-5-14N1	0.00	0.00	HE	*	229.0	229.0	229.0		
12-5-22C1	237.00	102.00	HE	*	146.3	182.9	182.9	166.7	169.7
12-5-22J2	355.00	120.00	HE	*	190.1	194.6	195.7	192.3	199.5
12-5-23A20	862.00	178.00	HE	*	182.6	181.8	183.6	187.0	181.0
12-5-36B20	500.00	430.00	HE						191.0
12-6-07P1	147.00	0.00	HE		243.9	245.3	248.5	244.2	240.2
12-6-18G1	198.00	70.00	HE		273.6	267.5	270.2	266.4	277.2
12-6-30E1	0.00	0.00	HE		348.9	348.6	349.0	348.0	347.5
13-6-07D2	0.00	0.00	HE		332.9	336.9	337.0	338.0	337.9
ROSSI 1	0.00	0.00	HE		222.4	218.6	222.9	227.3	229.0
Hollister West									
12-5-27E1	175.00	0.00	HW	*	181.7	198.3	199.8	195.2	198.8
12-5-28J1	220.00	0.00	HW	*	198.6	210.2	211.7	209.7	210.7
12-5-28N1	408.00	168.00	HW						217.7
12-5-33E2	121.00	81.00	HW	*	205.4	212.9	213.1	212.6	211.8
12-5-34P1	195.00	153.00	HW	*	199.3	216.6	216.6	220.8	217.6
13-5-03L1	126.00	0.00	HW	*	211.7	225.8	226.3	222.8	225.6
13-5-04B	0.00	0.00	HW		207.4	212.6	212.7	225.1	226.8
13-5-10B1	0.00	0.00	HW	*	219.6	218.6	218.8	231.0	215.6
13-5-10L1	252.00	52.00	HW		312.0	312.0	312.0	312.0	
13-5-11E1	0.00	0.00	HW		277.9	282.3	283.5	286.8	277.3
San Justo 4 (INDART)	0.00	0.00	HW		272.7		272.4	271.8	271.4
San Justo 6 (ROSE)	0.00	0.00	HW		231.9		234.7	233.4	234.2
Pacheco									
11-5-26N2	232.00	95.00	P	*	173.6	173.2	173.5	169.2	168.7
11-5-26R3	225.00	65.00	P	*	180.4	181.9	183.9	179.6	177.5
11-5-35C1	180.00	0.00	P	*	176.7	178.3	178.7	173.1	169.7
11-5-35G1	230.00	0.00	P	*	185.1	183.1	183.8	181.2	179.3
11-5-35Q3	0.00	0.00	P	*	159.7	168.4	157.2	144.7	167.8
11-5-36C1	98.00	0.00	P	*	194.3	196.2	198.7	194.9	194.0
11-5-36M1	0.00	0.00	P	*	185.7	184.2	184.8	182.5	180.4
11-6-31M2	188.00	155.00	P	*	241.8	227.0	228.7	225.7	231.0
12-5-01G2	300.00	0.00	P		186.7	184.0	185.0	182.2	180.4
12-5-02H5	128.00	42.00	P		178.8	176.3	180.6	178.3	176.8
12-5-02L2	170.00	0.00	P		194.6	194.5	195.6	193.3	192.4
12-5-03B1	128.00	100.00	P	*	182.0				182.0
12-6-06K1	260.00	16.00	P		260.0				260.0
12-6-06L4	235.00	50.00	P		221.6	220.9	222.0	220.1	218.1
San Juan									
12-4-17L20	0.00	0.00	SJ		121.9	123.6	124.2	122.2	118.9
12-4-18J1	0.00	0.00	SJ		121.6	124.2	122.6	123.1	122.6
12-4-20C3	0.00	0.00	SJ				110.2	107.2	110.0
12-4-21M1	250.00	0.00	SJ	*	139.7	146.3	146.3	143.5	142.6
12-4-26G1	876.00	240.00	SJ	*	145.9	155.7	160.3	127.4	154.3
12-4-34H1	387.00	120.00	SJ	*	152.7	166.9	171.6	154.8	156.7
12-4-35A1	325.00	110.00	SJ		165.5	187.5	192.4	176.3	174.1
12-5-30H1	240.00	0.00	SJ		185.7	203.3	204.3	205.5	204.8
12-5-31H1	0.00	0.00	SJ			206.3	207.6	178.9	198.6
13-4-03H1	312.00	168.00	SJ		146.4	166.1	170.5	158.2	156.1
13-4-4A3	0.00	0.00	SJ		197.9	197.2	195.4	191.9	188.1
RIDER BERRY	0.00	0.00	SJ		155.9		171.6	146.5	146.7

Table C-1. Groundwater Elevations October 2017 through October 2018

Well Number	Well Depth (feet)	Depth to Top of Screens (feet)	Subbasin	Key Well	Groundwater Elevations (feet MSL)				
					Oct-17	Jan-18	Apr-18	Jul-18	Oct-18
Tres Pinos									
13-5-12D4	0.00	0.00	TP		169.0	249.0	253.0	231.0	234.5
13-5-12K1	0.00	0.00	TP		316.0	320.0	322.0	322.8	321.9
13-5-12N20	352.00	301.00	TP	*	310.1	313.1	312.9	310.6	308.3
13-5-13F1	134.00	30.00	TP	*	325.7	326.2	326.7	325.3	323.6
13-5-13J2	180.00	0.00	TP	*	330.6	333.7	333.5	318.8	325.2
13-6-19J1	340.00	128.00	TP		428.6	429.1	429.4	424.4	429.0
13-6-19K1	211.00	0.00	TP	*	357.6	361.1	361.6	365.8	357.5
13-6-20K1	0.00	0.00	TP		427.5	427.8	428.7	422.1	426.2
Bolsa									
11-4-25H1	0.00	0.00	B		114.4	116.5	118.2	(5.2)	23.7
11-4-26B1	642.00	149.00	B	*	131.9	136.6	134.8	115.5	125.0
11-4-34A1	100.00	0.00	B	*	127.9	132.0	132.0	128.6	127.8
11-5-20N1	300.00	0.00	B	*	62.5	109.0	109.6	48.9	71.3
11-5-21E2	220.00	100.00	B		155.0				155.0
11-5-27P2	331.00	67.00	B		167.3	172.9	173.0	168.3	168.5
11-5-28B1	198.00	125.00	B		168.0				168.0
11-5-28P4	140.00	80.00	B		165.0				165.0
11-5-31F1	515.00	312.00	B	*	68.0	94.9	96.5	41.2	67.5
11-5-33B1	125.00	0.00	B		169.0				169.0
12-5-05M1	0.00	0.00	B		47.7	82.5	27.1	35.9	61.4
12-5-06L1	0.00	0.00	B	*	141.6	148.2	150.7	147.4	145.2
12-5-07P1	750.00	360.00	B		36.7	56.8	58.3	55.1	50.0
12-5-17D1	950.00	314.00	B			70.8	72.8	70.7	67.0
Paicines									
DONATI 6	0.00	0.00	Paicines		631.6	626.0	628.5	618.6	617.7
RFP Vineyard 3 (FRANCHIONI)	0.00	0.00	Paicines		646.9	656.0	656.3	655.8	657.8
RIDGEMARK 5	0.00	0.00	Paicines		639.6	641.6	601.3	636.3	635.1
RIDGEMARK 7	0.00	0.00	Paicines		628.7	633.8	634.6	635.8	638.3
SCHIELDS 2	0.00	0.00	Paicines		737.0	737.0	737.0		
SCHIELDS 4 (vineyard)	0.00	0.00	Paicines		625.7	632.3	632.8	609.3	608.3
Pacheco Creek									
11-5-12E1	103.00	52.00	PC	*	243.3	238.6			
11-5-13D1	125.00	0.00	PC	*	229.3	228.4	230.1	219.5	190.1
11-5-24C1	134.00	0.00	PC	*	213.9			212.9	207.4
11-5-24C2	165.00	70.00	PC	*	225.9	224.7	226.0	223.0	216.3
11-5-24L1	70.00	0.00	PC	*	212.7	210.4	211.7	207.9	211.8
11-5-25G1	225.00	0.00	PC	*	223.0	206.8	207.9	211.8	210.7
Tres Pinos Creek Valley									
1536	0.00	0.00	TPCV		276.0	295.0	297.0	294.5	293.0
DONATI 2	0.00	0.00	TPCV		654.6	651.5	651.1	649.4	636.4
GRANITE ROCK WELL 1	0.00	0.00	TPCV		299.6		305.7	304.9	305.5
GRANITE ROCK WELL 2	0.00	0.00	TPCV		314.5		319.7	315.4	315.9
San Justo 5 (WINDMILL)	0.00	0.00	TPCV		273.9		276.1	275.7	275.4
WILDLIFE CENTER 5	0.00	0.00	TPCV		705.6	709.5	711.7	713.8	711.5
SCVWD									
11S04E02D008	0.00	0.00	SCVWD		151.4	163.6	150.4	126.6	142.7
11S04E02N001	0.00	0.00	SCVWD		147.0	156.7	155.6	116.1	134.8
11S04E03J002	0.00	0.00	SCVWD		152.5	161.4	149.7	122.4	140.4
11S04E08K002	0.00	0.00	SCVWD		152.5	161.5	161.4	144.9	145.0
11S04E10D004	0.00	0.00	SCVWD		143.8	159.0	152.1	127.0	137.9
11S04E15J002	0.00	0.00	SCVWD		133.0			111.6	123.1
11S04E17N004	0.00	0.00	SCVWD		153.7	161.7	160.4	145.2	144.9
11S04E21P003	0.00	0.00	SCVWD		139.2	147.8	143.4	120.6	132.8
11S04E22N001	0.00	0.00	SCVWD		134.6	142.3	139.2	114.4	128.0
11S04E32R002	0.00	0.00	SCVWD		128.0	133.6	128.6	111.1	121.4

Table C-2. Groundwater Change Attributes

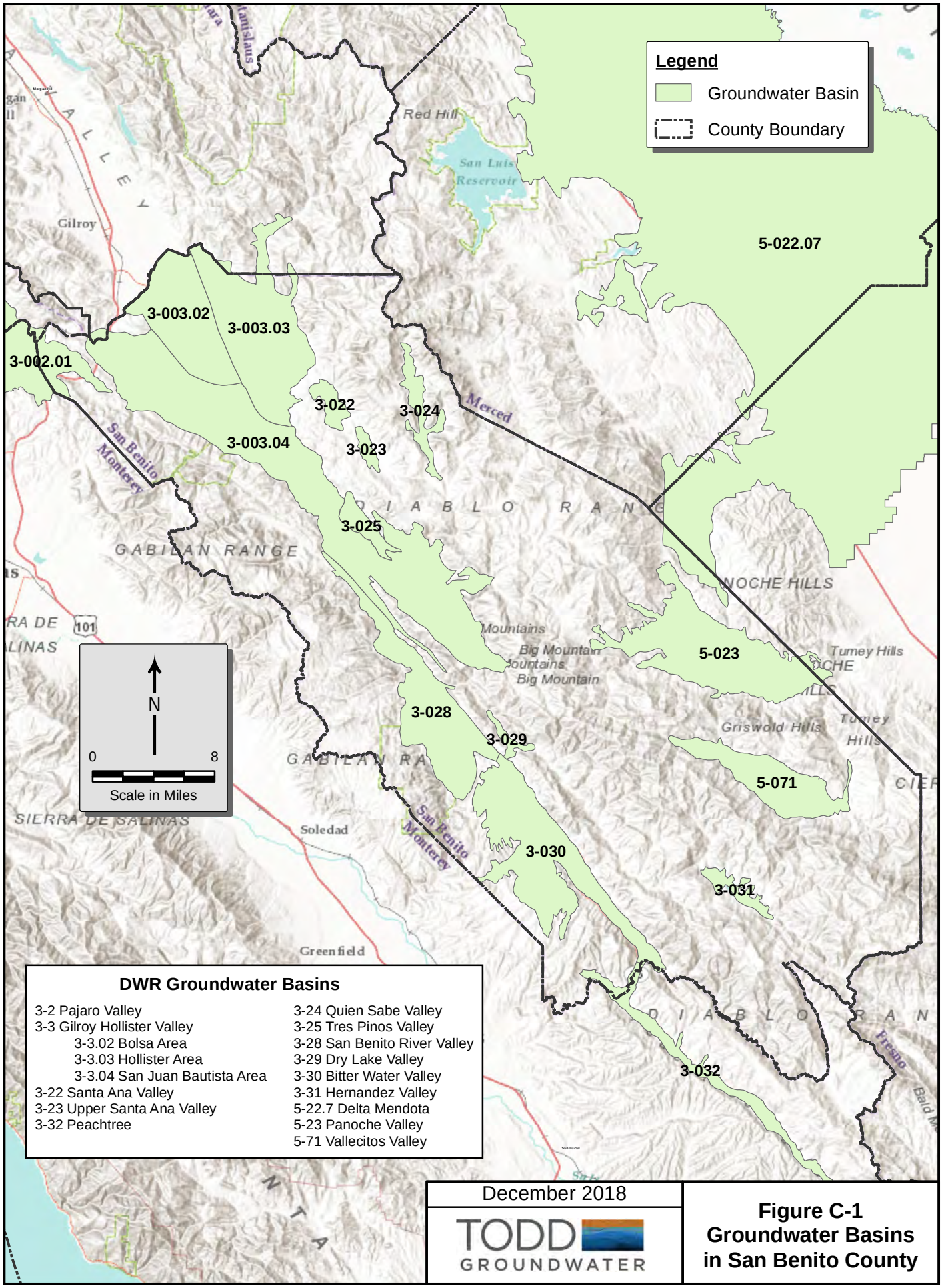
Subbasin	Subbasin Area (Acres)	Average Storativity
San Juan	11,708	0.05
Hollister West	6,050	0.05
Tres Pinos	4,725	0.05
Pacheco	6,743	0.03
Northern Hollister East	10,686	0.03
Southern Hollister East	5,175	0.03
Bolsa SE	2,691	0.08
Bolsa	20,003	0.01

Table C-3. Groundwater Change in Elevation 2017-2018 (feet)

Subbasin	Average Change in Groundwater Elevation												
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
San Juan	0.87	(4.49)	0.29	(0.75)	(1.39)	(0.89)	-	(10.66)	(7.95)	(9.45)	(3.56)	14.57	3.55
Hollister West	3.13	(1.69)	3.31	(1.43)	(1.58)	(0.66)	2.12	(5.72)	(17.41)	(3.60)	0.93	6.89	9.51
Tres Pinos	2.47	(2.34)	0.72	8.10	(10.52)	0.97	2.54	(2.48)	(6.66)	(6.68)	(6.04)	4.38	0.91
Pacheco	1.93	(4.41)	(1.36)	8.10	(6.60)	1.92	(4.36)	(2.95)	(7.37)	1.92	2.98	8.58	(2.41)
Northern Hollister East	3.64	(6.51)	(4.21)	10.15	(8.73)	2.72	(2.36)	1.65	(9.10)	0.76	(1.48)	5.82	2.55
Southern Hollister East	3.26	(1.46)	5.45	9.39	4.93	(1.94)	(2.18)	(1.14)	(6.87)	1.61	8.13	0.46	7.23
Bolsa SE	1.55	(6.78)	11.51	(24.80)	25.29	(11.65)	0.25	(4.27)	(10.68)	(3.34)	(9.94)	8.21	7.17
Bolsa	6.79	(3.30)	8.97	(16.86)	23.15	(11.19)	10.72	(3.37)	(25.56)	4.57	(2.89)	10.62	(2.57)

Table C-4. Groundwater Change in Storage 2006-2018 (acre-feet)

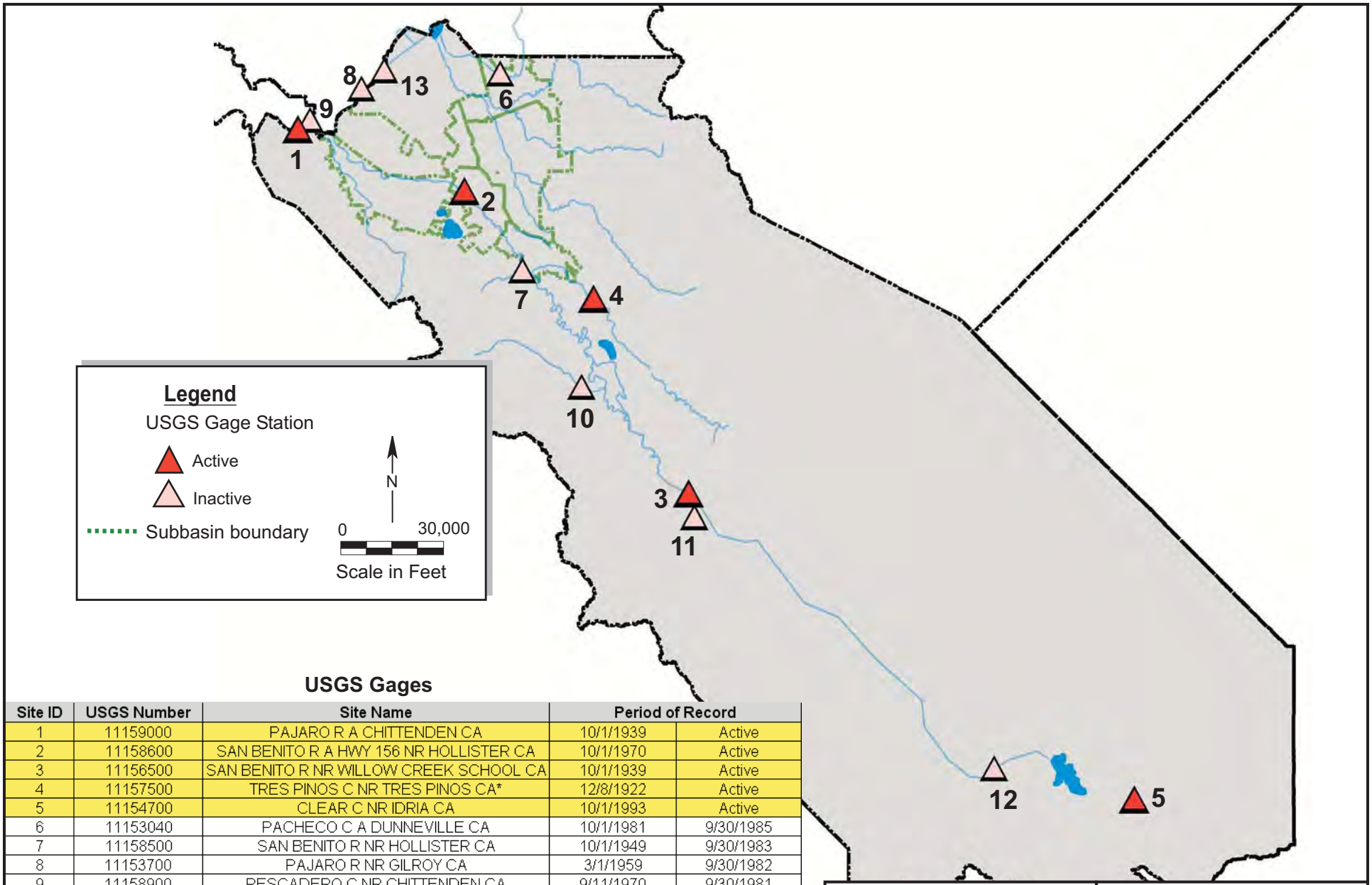
Subbasin	Average Change in Groundwater Storage (AF)												
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
San Juan	510	(2,626)	168	(437)	(811)	(523)	-	(6,239)	(4,653)	(5,530)	(2,086)	8,531	2,077
Hollister West	947	(510)	1,001	(431)	(477)	(198)	640	(1,730)	(5,267)	(1,090)	282	2,084	2,878
Tres Pinos	584	(553)	169	1,913	(2,485)	228	601	(586)	(1,574)	(1,579)	(1,427)	1,034	216
Pacheco	391	(892)	(275)	1,639	(1,335)	389	(882)	(597)	(1,490)	388	604	1,736	(488)
Northern Hollister East	1,167	(2,087)	(1,350)	3,253	(2,798)	870	(757)	528	(2,918)	242	(474)	1,867	818
Southern Hollister East	506	(227)	846	1,457	766	(301)	(339)	(177)	(1,067)	250	1,263	72	1,123
Bolsa SE	333	(1,458)	2,478	(5,338)	5,443	(2,508)	53	(918)	(2,300)	(719)	(2,139)	1,767	1,543
Bolsa	1,358	(659)	1,794	(3,372)	4,631	(2,239)	2,144	(674)	(5,112)	915	(578)	2,125	(514)



December 2018

TODD GROUNDWATER

Figure C-1
Groundwater Basins in San Benito County



USGS Gages

Site ID	USGS Number	Site Name	Period of Record	
1	11159000	PAJARO R A CHITTENDEN CA	10/1/1939	Active
2	11158600	SAN BENITO R A HWY 156 NR HOLLISTER CA	10/1/1970	Active
3	11156500	SAN BENITO R NR WILLOW CREEK SCHOOL CA	10/1/1939	Active
4	11157500	TRES PINOS C NR TRES PINOS CA*	12/8/1922	Active
5	11154700	CLEAR C NR IDRIA CA	10/1/1993	Active
6	11153040	PACHECO C A DUNNEVILLE CA	10/1/1981	9/30/1985
7	11158500	SAN BENITO R NR HOLLISTER CA	10/1/1949	9/30/1983
8	11153700	PAJARO R NR GILROY CA	3/1/1959	9/30/1982
9	11158900	PESCADERO C NR CHITTENDEN CA	9/11/1970	9/30/1981
10	11156700	PESCADERO C NR PAICINES CA	7/1/1959	10/7/1970
11	11156450	WILLOW C TRIB NR SAN BENITO CA	7/1/1964	9/30/1969
12	11156000	SAN BENITO R BL M C NR HERNANDEZ CA	10/1/1949	9/30/1963
13	11154500	PAJARO R A SARGENT CA	10/1/1940	9/30/1941

* WY 2006 data for gage height only

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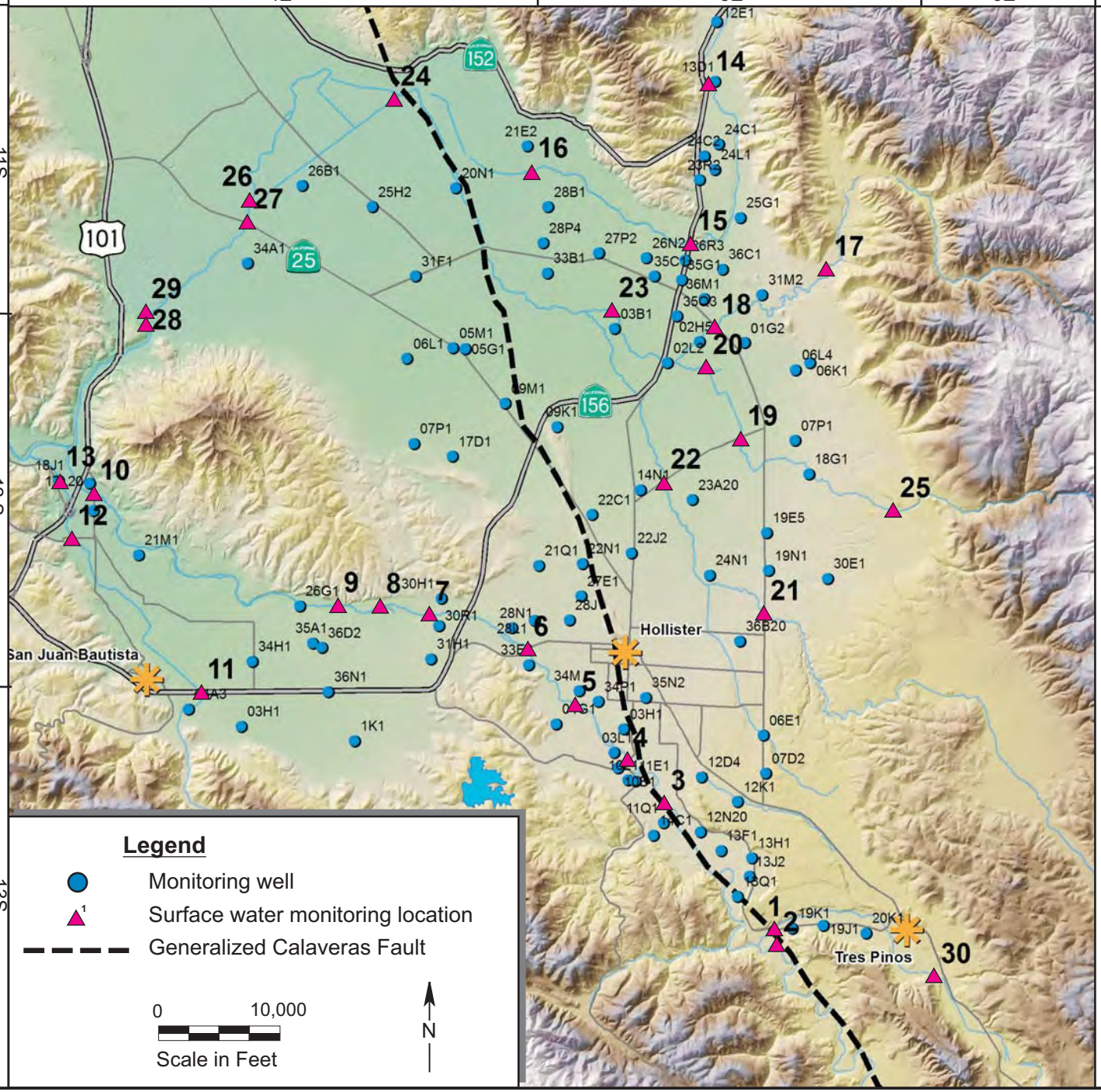
Figure C-2
Location of Streamflow Stations



Surface Water Monitoring Locations

1. Tres Pinos Cr - Southside Road Bridge (West)
2. San Benito River - KT Road bridge
3. San Benito River - Hospital Road
4. San Benito River - Cienega Road
5. San Benito River - Nash Road
6. San Benito River - Old Highway 156
7. San Benito River - near Mitchell Road
8. San Benito River - near Flint Road
9. San Benito River - upstream of Bixby Road
10. San Benito River - Y Road
11. San Juan Creek - - Highway 156
12. San Juan Creek - Anzar Road
13. San Juan Creek - 2000 ft downstream of Highway101
14. Pacheco Creek - Walnut Avenue
15. Pacheco Creek - Highway 156
16. Pacheco Creek - Lovers Lane
17. Arroyo de las Viboras - Hawkins Ranch driveway
18. Arroyo de las Viboras - Fairview Road
19. Arroyo Dos Picachos - Fallon Road
20. Arroyo Dos Picachos - Aquistapace Road
21. Santa Ana Creek - Fairview Road
22. Santa Ana Creek - Fallon Road
23. Tequisquita Sough - San Felipe Road
24. Millers Canal - 2000 ft downstream of San Felipe Lake
25. Arroyo Dos Picachos - Lone Tree Road
26. Pajaro River - above Millers Canal
27. Pajaro River - Highway 25
28. Pajaro River - below Carnadero Creek
29. Carnadero Creek - above Pajaro River
30. Tres Pinos Creek - Bolado Park

Figure C-3
Monitoring Locations

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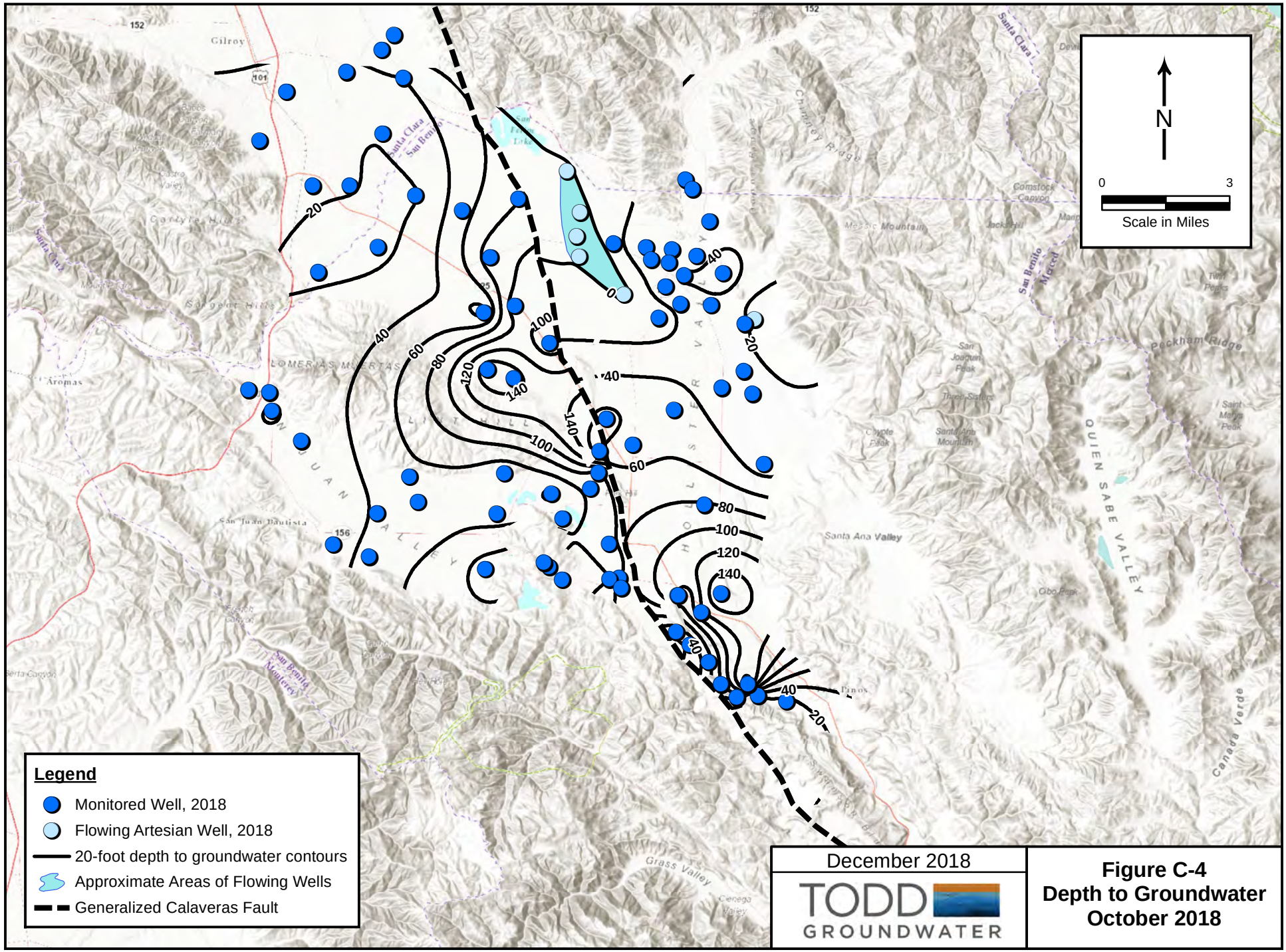

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Figure C-4
Depth to Groundwater
October 2018

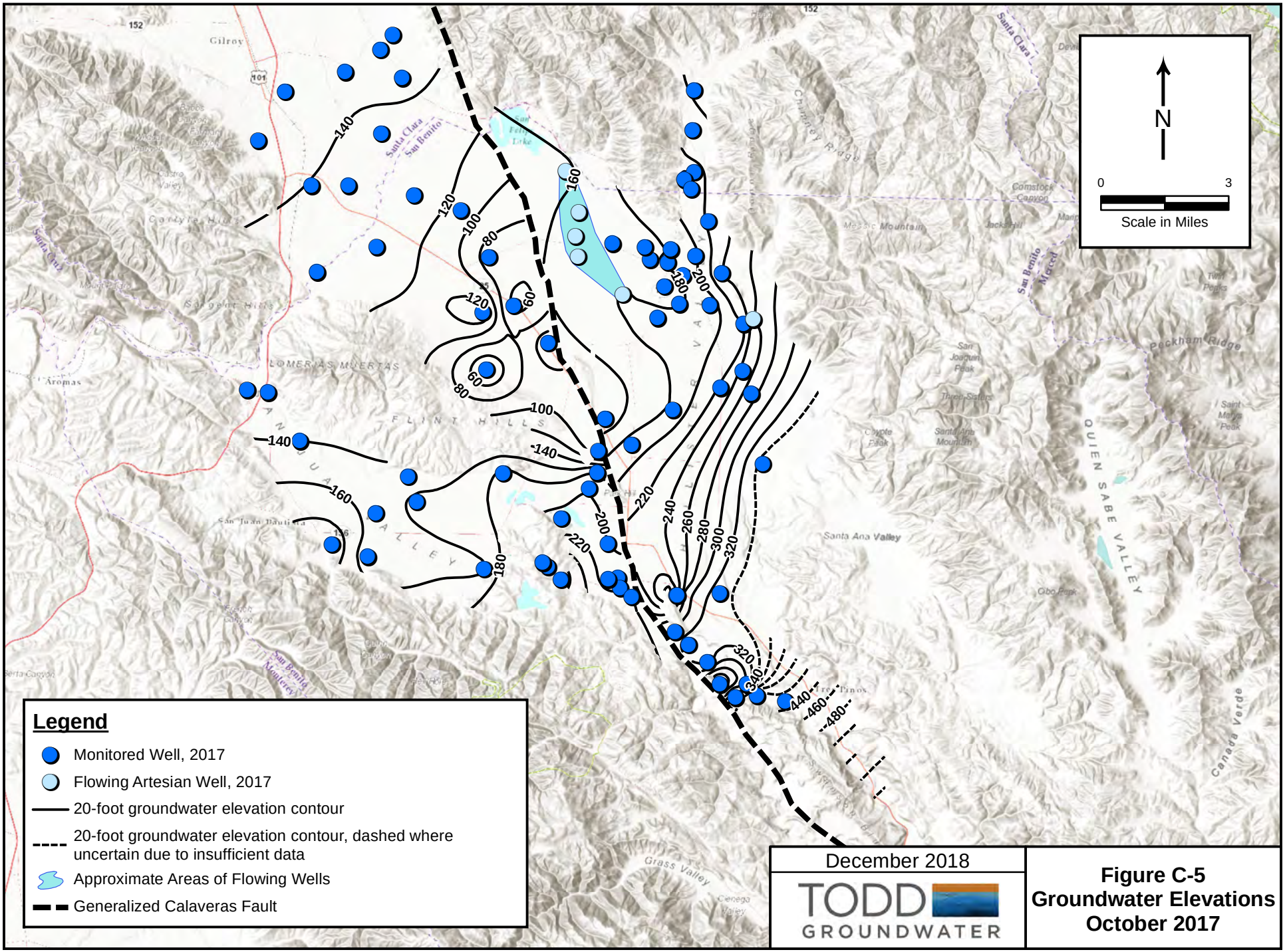

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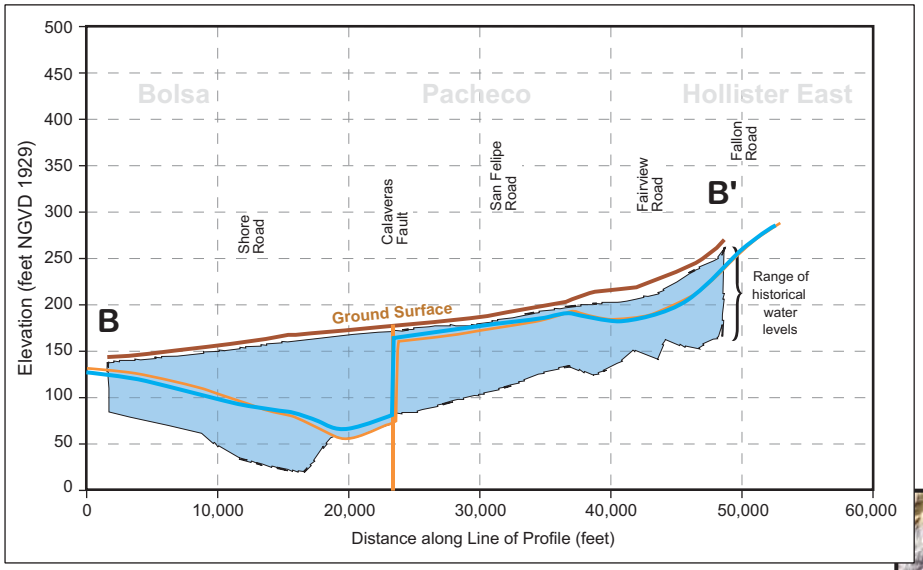
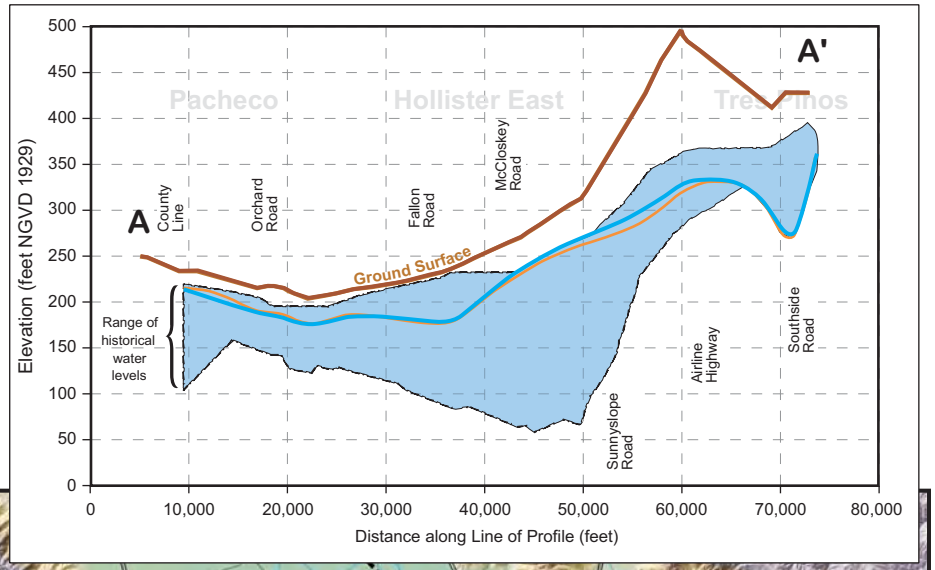
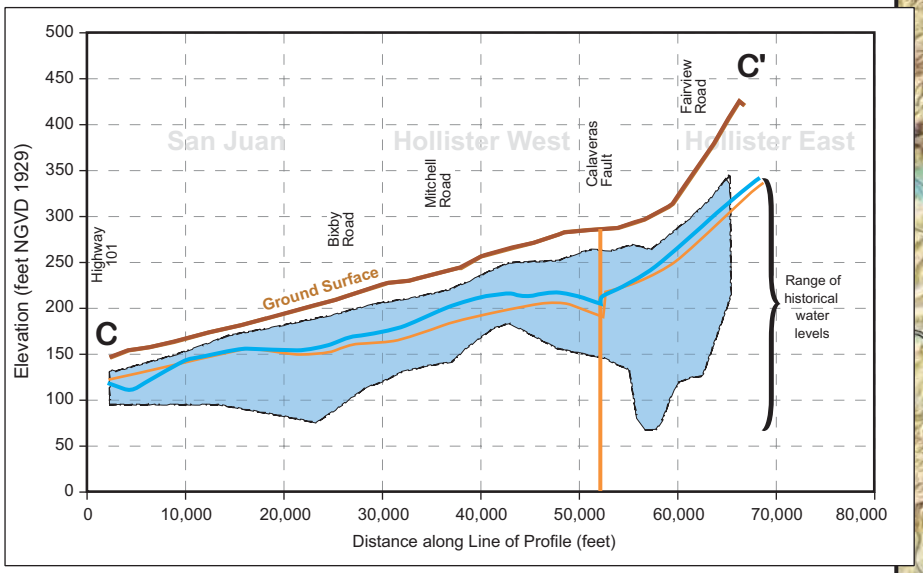
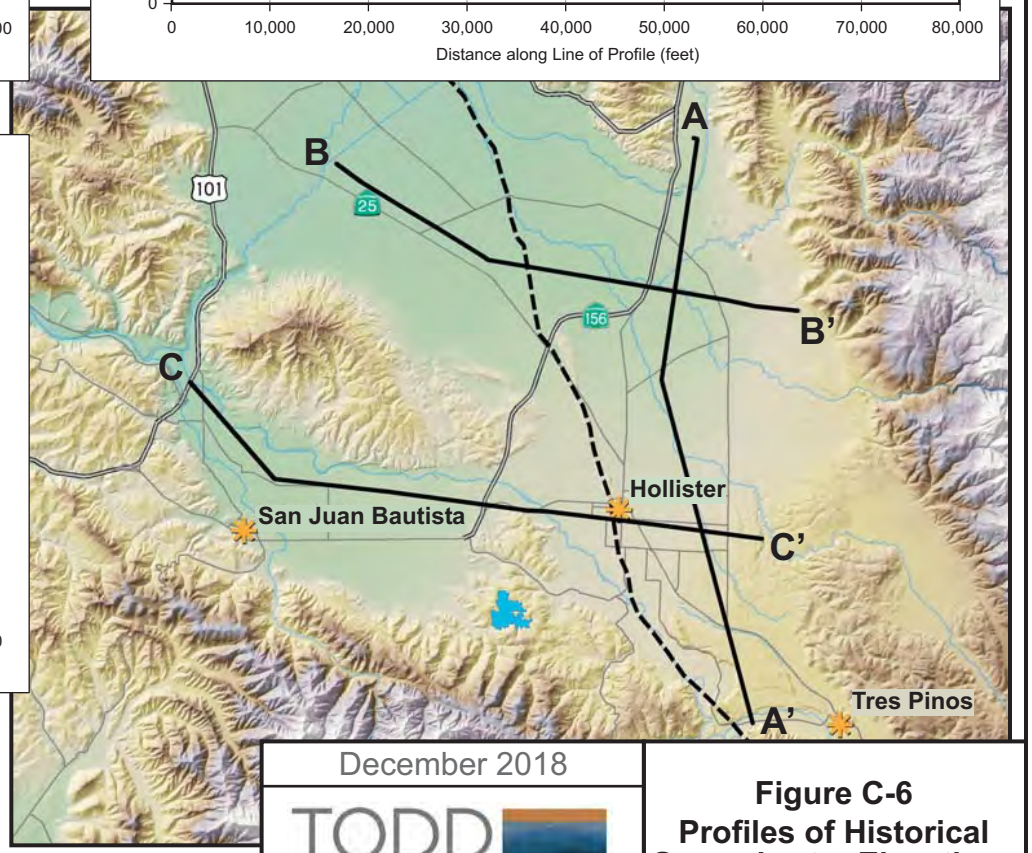
Figure C-5
Groundwater Elevations
October 2017









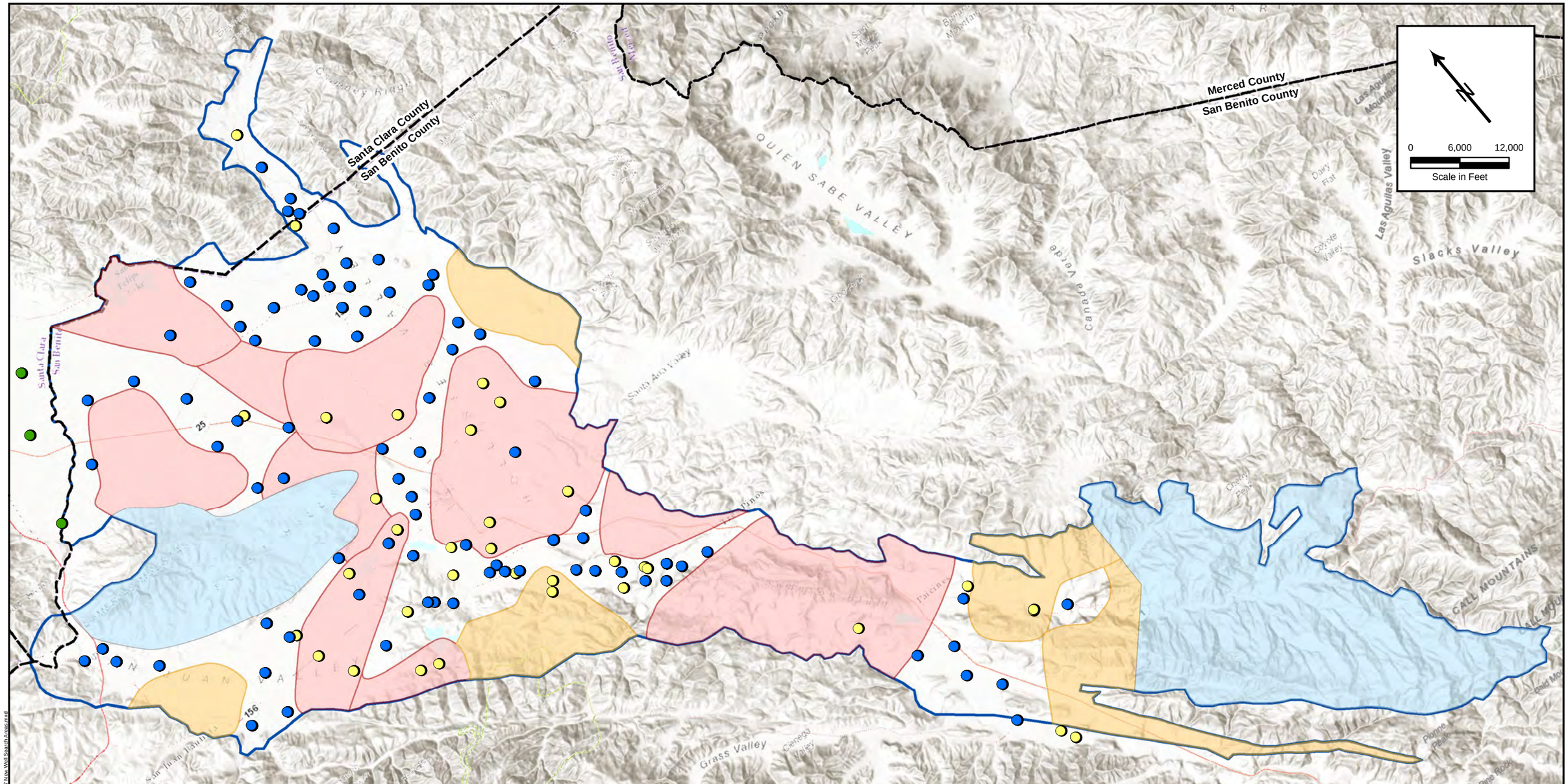
Legend

- Ground Surface
- Water year 2017
- Water Year 2018
- Range of Historical Water Levels

December 2018

TODD GROUNDWATER

Figure C-6
Profiles of Historical Groundwater Elevations



- SBCWD Monitored Wells, October 2018
- SCVWD Monitored Wells, October 2018
- Well Monitored in Prior Years and not October 2018
- Adequately Monitored Area
- High Priority Target Area
- Low Priority Area
- Area with Few to No Wells
- North San Benito Basin

December 2018

TODD GROUNDWATER

Figure C-7
Monitored and Unmonitored Areas
North San Benito Basin

TECHNICAL MEMORANDUM

Subject: Sustainable Groundwater Management Act –

Process for Establishing Well Network to Monitor Groundwater in San Benito County

Prepared For: Jeff Cattaneo, P.E. SBCWD General Manager

Prepared by: David Macdonald, Assistant Engineer

Reviewed by: Garrett Haertel, P.E. Deputy District Engineer

Date: November 21, 2018

Organization of TM

- Background
- Purpose
- Discussion
- Conclusions
- Recommendations

BACKGROUND

San Benito County Water District (SBCWD) has continuously managed the groundwater in San Benito County for over 50 years. In 2017, SBCWD became the Groundwater Sustainability Agency (GSA) for San Benito County to satisfy requirements of the Sustainable Groundwater Management Act (SGMA). This designation allows SBCWD to be the lead agency in preparing a Groundwater Sustainability Plan (GSP) for a significant portion of San Benito County.

After reviewing the current network of monitored wells, it became evident that in order to fully comply with SGMA, additional wells were needed to increase monitoring coverage of the groundwater basin.

PURPOSE

The purpose of this technical memorandum is to detail the procedure for finding and adding new wells to the monitoring network.

DISCUSSION

Additional wells are needed in the San Juan Bautista, Tres Pinos Valley, Bolsa, and Hollister sub-basins in order to provide quality coverage. Todd Groundwater is SBCWD's consultant regarding groundwater management, and they have provided a map titled "Historically Monitored Wells" which indicates areas where data is lacking. These areas were targeted in the search for additional

wells to add to the monitoring network. SBCWD utilized the following procedure to locate potential wells to add extra coverage within the groundwater subbasins.

Finding Wells for Monitoring Groundwater Conditions

First Method

1. Determine areas of need based on the "Historically Monitored Wells" map.
2. Use county GIS map to determine Assessor's Parcel Number (APN) of parcels within areas of need.
3. Use the APNs to locate well logs within SBCWD's files.
4. Locate the well on an aerial map to verify location/existence.

Second Method

1. Search the targeted areas on an aerial map to locate wells that may not be in SBCWD's files. This is done by looking for pipes and lone power poles in locations where a well would be advantageous.
2. Use the coordinates from Google Maps to map the location of the well on ArcGIS.
3. Use county GIS map to determine APN numbers of parcels within areas of need.
4. Confirm and verify location.

Acquiring Rights to Use Wells for Monitoring Groundwater Conditions

1. Use APN's to determine the owner of each well.
2. Produce and send a letter requesting permission to access the well for water level measurements and/or test water quality.
3. Once permission is granted, visit site and determine method of measurement/testing.

Repairing/Re-activating Previous Wells for use

1. Determine wells with access issues and follow up with owner to get keys/access.
2. Determine wells that can be altered/repaired to re-activate, and assess access.
3. If well can be reactivated, assess well condition (functioning, collapsed, etc.)

CONCLUSIONS

More monitoring wells are necessary to cover the entire area of the groundwater basins in San Benito County. This effort will improve the quality and credibility of data that SBCWD can produce to ensure compliance with SGMA. SBCWD's groundwater management activities can be further improved by increasing the amount of data collected within the county subbasins.

RECOMMENDATIONS

Based on this information it is recommended that the following actions be taken:

- Locate as many potential wells as possible.
- Request Owners to allow SBCWD access/permission to monitor groundwater conditions.
- Increase long term monitoring network.

APPENDIX D PERCOLATION DATA

List of Tables and Figures

Table D-1. Reservoir Water Budgets for Water Year 2018 (acre-feet)

Table D-2. Historical Reservoir Releases (AFY)

Table D-3. Historical Percolation of CVP Water (AFY)

Table D-4. Percolation of Municipal Wastewater during Water Year 2018

Table D-5. Historical Percolation of Municipal Wastewater (AFY)

Figure D-1. Reservoir Releases for Percolation

Figure D-2. Wastewater Percolation by Facility

Table D-1. Reservoir Water Budgets for Water Year 2018 (acre-feet)

	Hernandez	Paicines	San Justo	
Observed Storage				
Starting Storage (Oct 2017)	800	300	7,942	
Ending Storage (Sept 2018)	375	300	5,131	
Inflows				
Rainfall	106	13	145	
San Benito River	6,437	8	n.a.	
Hernandez-Paicines transfer	n.a.	516	n.a.	
San Felipe Project*	n.a.	n.a.	18,952	*
Total Inflows	**6,543**	**537**	**19,097**	
Outflows				
Hernandez spills	0	n.a.	n.a.	
Hernandez-Paicines transfer	516	n.a.	n.a.	
Tres Pinos Creek percolation releases	n.a.	384	n.a.	
San Benito River percolation releases	6,054	n.a.	n.a.	
CVP Deliveries*	n.a.	n.a.	21,899	*
Evaporation and seepage	136	58	1,360	
Total Outflows	**6,707**	**442**	**23,259**	
Change in Storage				
Observed storage change (Ending - Starting)	**-425**	**0**	**-2,811**	
Calculated net storage change (Inflow - Outflows)	**-163**	**95**	**-4,162**	
Unaccounted for Water (Observed - Calculated)**	**-262**	**-95**	**1,351**	

Reservoir Information			
Reservoir capacity	17,200	2,870	11,000
Maximum storage	4,154	515	10,349
Minimum storage	375	100	4,113

* Reflects imported water for beneficial use, not all stored in reservoir

** Negative value is water shortage, positive value is water surplus

Table D-2. Historical Reservoir Releases (AFY)

WY	Hernandez	Paicines	TOTAL
1996	13,535	6,139	19,674
1997	3,573	2,269	5,842
1998	26,302	450	26,752
1999	12,084	1,293	13,377
2000	13,246	2,326	15,572
2001	12,919	3,583	16,502
2002	9,698	310	10,008
2003	5,434	0	5,434
2004	3,336	0	3,336
2005	19,914	677	20,591
2006	14,112	196	14,308
2007	12,022	1,254	13,276
2008	7,646	495	8,141
2009	4,883	0	4,883
2010	8,484	4,147	12,631
2011	9,757	2,397	12,154
2012	6,341	1,321	7,662
2013	3,963	677	4,640
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	23,191	2,407	25,597
2018	6,054	384	6,438
AVG	**9,413**	**1,318**	**10,731**

Table D-3. Historical Percolation of CVP Water (AFY)

Water Year	Pacheco Creek	Arroyo de las Viboras			Arroyo Dos Picachos			Santa Ana Creek				Tres Pinos Creek	San Benito River	Total
		Road	Creek 1	Creek 2	Fallon Road	Jarvis Lane	Creek	John Smith Road	Maranatha Road	Airline Highway	Ridgemark			
1994	232	136	515	0	0	550	209	0	0	0	0	85	158	**1,885**
1995	444	238	770	2	0	654	622	73	0	0	0	809	2,734	**6,345**
1996	0	494	989	832	67	235	708	531	197	134	25	21	6,097	**10,330**
1997	0	447	601	1,981	77	0	200	17	353	286	29	1,477	5,619	**11,087**
1998	0	132	109	403	0	0	0	65	0	158	74	518	1,084	**2,543**
1999	0	0	0	0	0	0	4	256	48	141	10	452	413	**1,322**
2000	1	0	0	6	0	0	3	236	21	240	12	285	938	**1,740**
2001	0	0	0	0	0	0	0	161	17	186	1	703	1,041	**2,110**
2002	0	0	0	2	0	0	1	78	2	143	0	426	470	**1,122**
2003	0	0	0	0	0	0	5	119	9	172	0	163	605	**1,074**
2004	0	0	0	0	0	0	52	83	0	0	0	1	882	**1,018**
2005	0	0	0	0	0	0	0	0	0	0	0	0	527	**527**
2006	0	0	0	0	0	0	7	156	0	0	0	1	451	**614**
2007	0	0	0	0	0	0	0	0	0	0	0	88	216	**304**
2008	0	0	0	0	0	0	0	0	0	0	0	0	6	**6**
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2017*	0	0	340	0	0	0	0	0	0	0	0	0	2,209	**2,549**
2018*	0	0	199	0	0	0	0	0	0	0	0	867	1,899	**2,965**

*2017-2018 percolation occurred only to recharge basins adjacent to the listed streams.

Table D-4. Percolation of Municipal Wastewater during Water Year 2018

	Pond Area[1] (acres)	Effluent Discharge (acre-feet)	Evaporation[2] (acre-feet)	Percolation (acre-feet)
Hollister - domestic*	92.9	1,631	266	1,365
Hollister - industrial*	39.0	85	28	57
Ridgemark Estates I & II	7.2	171	21	150
Tres Pinos	1.8	20	5	15
Total	**141**	**1,907**	**320**	**1,587**

Notes:

1. Hollister pond areas are from Dickson and Kenneth D. Schmidt and Associates (1999) and include treatment ponds in addition to percolation ponds at the domestic wastewater treatment plant. Assumes 80% of total pond area in use at any time (Rose, pers. comm.). These areas should be updated as operations change.

2. Average evaporation less precip = 43 inches (56 in/yr evaporation (DWR Bulletin 73-79) less 13 in/yr precip (CIMIS) The IWTP evaporation was adjusted to account only for when the ponds are in use.
The San Juan Bautista plant is not included because the unnamed tributary of San Juan Creek that receives its effluent usually gains flow along the affected reach and is on the southwest side of the San Andreas Fault. These conditions prevent the effluent from recharging the San Juan Subbasin.

Table D-5. Historical Percolation of Municipal Wastewater (AFY)

	Hollister Reclamation Plant - Domestic	Hollister - industrial	Ridgemark Estates I & II	Tres Pinos	TOTAL
1994	1,775	665	155	5	2,600
1995	1,935	610	180	10	2,735
1996	2,020	689	207	14	2,930
1997	1,965	909	201	17	3,092
1998	2,490	518	231	17	3,256
1999	1,693	1,476	156	12	3,337
2000	2,110	1,136	293	24	3,563
2001	1,742	1,078	303	24	3,147
2002	1,884	1,545	283	24	3,736
2003	2,009	1,432	279	24	3,744
2004	1,787	1,536	268	21	3,612
2005	1,891	1,323	227	26	3,468
2006	1,797	1,211	216	33	3,257
2007	1,740	1,228	139	19	3,126
2008	1,580	1,257	139	19	2,996
2009	1,976	428	172	19	2,594
2010	1,922	37	172	19	2,150
2011	1,807	466	183	19	2,476
2012	1,740	605	177	19	2,541
2013*	889	332	188	21	1,430
2014	1,552	86	179	21	1,838
2015	1,816	344	161	21	2,342
2016	1,923	305	154	21	2,402
2017	1,945	57	154	20	2,177
2018	1,365	57	150	15	1,587

*Potential missing data

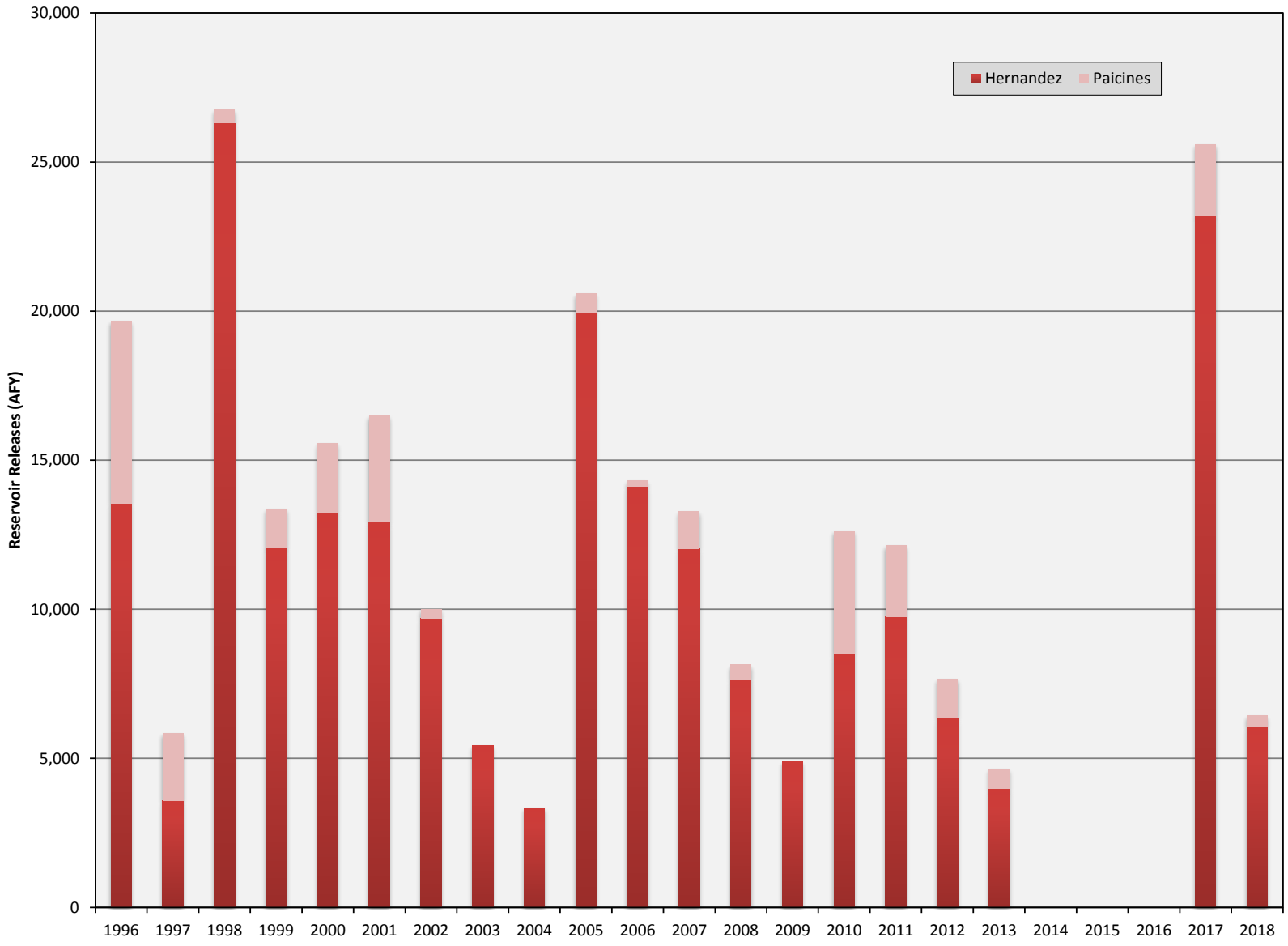


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Figure D-1
Reservoir Releases for Percolation

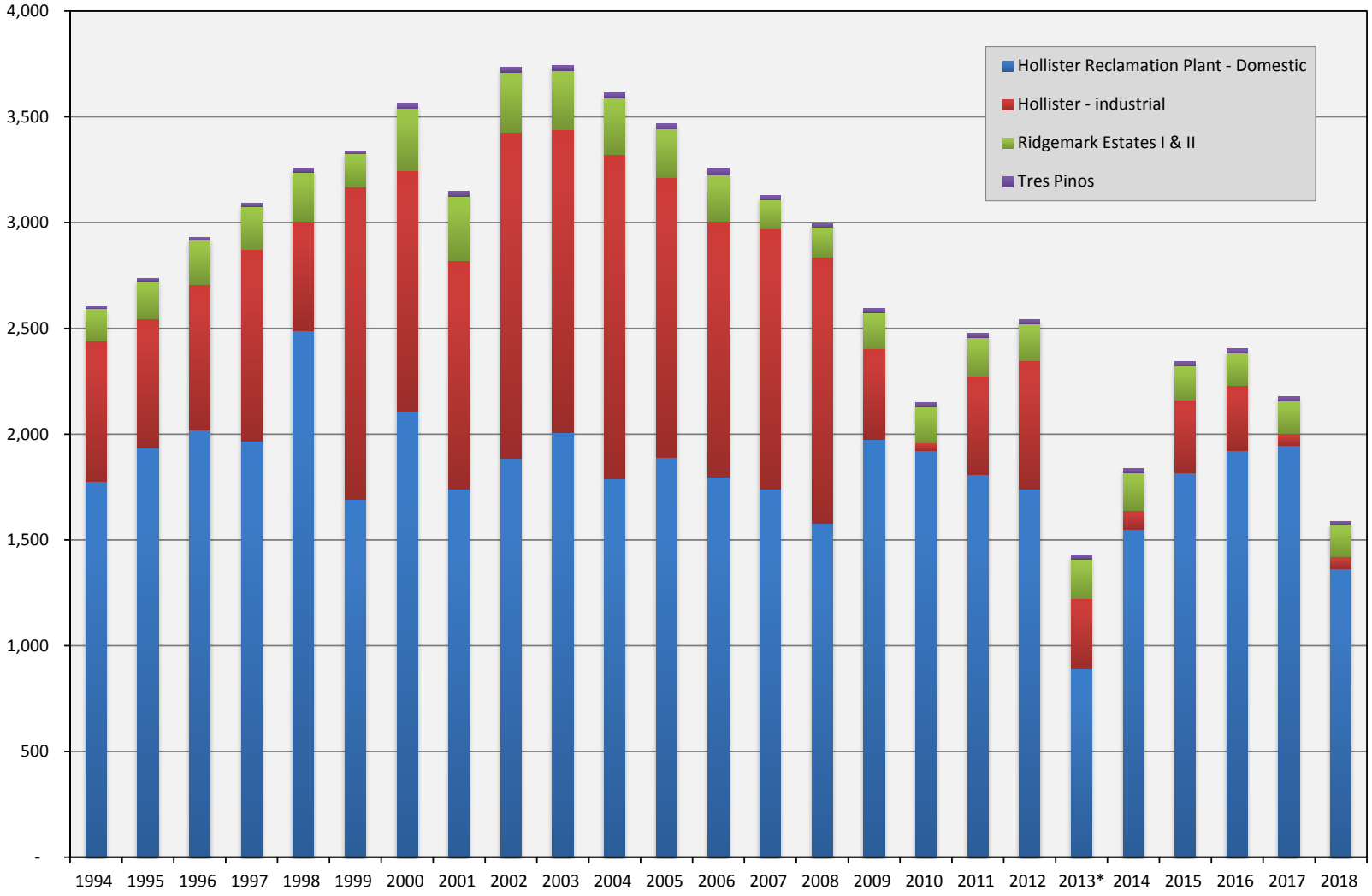

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Figure D-2 Wastewater Percolation by Facility

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Figure E-5. Municipal Water Use by Purveyor

Table E-1. Recent CVP Allocation and Use

	Municipal and Industrial (M&I) CVP				Agricultural CVP			
Water Year	Percent of Contract Allocation	Percent of Historic Average	Contract Amount Used (AF)	Contract Amount Used (%)	Percent of Contract Allocation	Percent of Contract and M&I Adjustment[1]	Contract Amount Used (AF)	Contract Amount Used (%)
	(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)		(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)	
2006	100%		3,152	38%	100%		19,840	56%
2007	100%		4,969	60%	40%		18,865	53%
2008	37%	75%	2,232	27%	40%	45%	10,514	30%
2009	29%	60%	1,978	24%	10%	11%	6,439	18%
2010	37%	75%	2,197	27%	45%	50%	10,061	28%
2011	100%		2,433	29%	80%		16,234	46%
2012	51%	75%	2,683	33%	40%	40%	17,267	49%
2013	47%	70%	2,652	32%	20%	22%	12,914	36%
2014	34%	50%	1,599	29%	0%	0%	7,545	21%
2015	25%		1,810	22%	0%		3,697	10%
2016	55%		1,914	23%	5%		4,434	12%
2017	100%		2,909	35%	100%		13,288	37%
2018	75%		5,679	69%	50%		14,453	41%

Notes: [1]Shortage Policy Adjustments

Table E-2. Historical Water Use by Subbasin and Water Source (AFY)

Subbasin	Pacheco		Bolsa Southeast			San Juan		Hollister West			Hollister East			Tres Pinos		Total Zone 6		
Source	GW	CVP	GW	CVP	RW	GW	CVP	GW	CVP	RW	GW	CVP	RW	GW	CVP	GW	CVP	RW
1993	2,251	3,210	3,474	533		9,278	4,300	7,213	90		3,744	7,275		5,658	224	31,618	15,633	-
1994	3,748	3,394	3,467	602		10,859	3,836	7,327	87		5,475	6,808		5,294	263	36,169	14,990	-
1995	2,756	3,474	2,855	720		9,328	4,554	7,092	460		3,428	6,647		4,475	275	29,935	16,130	-
1996	2,533	3,500	2,682	782		8,726	5,187	5,717	679		3,396	8,267		3,695	408	26,748	18,823	-
1997	2,209	4,205	2,755	997		9,587	6,191	7,602	907		3,534	8,284		4,620	466	30,307	21,048	-
1998	2,035	2,165	1,561	361		6,963	4,099	4,991	591		4,037	5,291		3,751	289	23,338	12,796	-
1999	2,553	3,219	2,453	433		9,312	5,990	7,013	726		3,701	7,279		4,199	391	29,231	18,038	-
2000	2,270	3,256	2,418	355		8,681	6,372	7,590	869		3,108	7,279		4,006	542	28,073	18,673	-
2001	1,848	3,443	2,126	411		7,977	7,232	7,377	685		2,213	7,010		3,599	621	25,140	19,402	-
2002	2,322	3,840	2,193	497		7,571	7,242	6,577	706		2,588	7,390		3,994	737	25,244	20,411	-
2003	2,425	3,277	2,175	493		7,434	7,127	6,222	720		1,897	9,329		2,805	788	22,958	21,734	-
2004	2,461	3,607	2,405	740		8,121	7,357	4,971	614		2,321	10,726		3,204	966	23,484	24,010	-
2005	1,320	3,106	1,849	514		6,608	6,245	5,084	680		2,586	9,198		2,378	642	19,825	20,384	-
2006	1,208	3,495	1,864	661		6,741	7,200	4,633	579		2,555	10,253		2,537	803	19,538	22,992	-
2007	1,034	3,832	2,005	572		7,658	6,160	5,118	553		3,867	10,194		2,908	804	22,590	22,115	-
2008	1,900	1,568	2,014	333		7,796	3,160	4,375	399		3,962	6,792		2,743	493	22,789	12,745	-
2009	3,370	1,257	2,082	179		11,956	1,605	4,186	19		4,733	4,697		2,871	447	29,199	8,204	-
2010	2,553	1,771	1,897	207		9,561	3,452	4,081	10	151	4,460	6,056		1,686	488	24,238	11,984	151
2011	1,992	2,420	2,781	229		4,987	5,623	3,940	394	183	1,947	9,575		2,454	427	18,102	18,667	183
2012	3,723	2,652	1,556	288		5,782	5,976	4,298	549	230	2,004	9,917		2,492	568	19,855	19,949	230
2013	4,157	1,976	2,348	292		11,044	4,134	5,656	374	357	5,430	8,224		2,452	565	31,087	15,566	357
2014	3,303	1,020	2,157	32		10,018	1,984	7,227	233	262	4,872	5,490		3,014	384	30,592	9,144	262
2015	4,279	555	2,401	20		12,739	975	4,730	148	101	7,230	3,568		2,948	241	34,327	5,507	101
2016	4,386	420	2,558	30	38	13,581	819	4,031	162	253	6,383	4,810	207	2,223	106	33,162	6,347	499
2017	2,949	2,097	1,414	365	66	7,542	5,853	3,255	217	108	2,209	7,488	192	2,447	177	19,815	16,197	366
2018	4,375	1,529	3,063	291	3	8,932	6,383	3,922	2,054	468	3,699	9,686	-	1,865	188	25,856	20,131	471
AVG 03-18	**2,840**	**2,161**	**2,161**	**328**	**36**	**8,781**	**4,628**	**4,733**	**482**	**235**	**3,760**	**7,875**	**133**	**2,564**	**505**	**24,839**	**15,980**	**164**

GW = groundwater, CVP = Central Valley Project, RW = recycled water

Table E-3. Recent Water Use by Subbasin and User Type, Includes Recycled Water (AFY)

SUBBASIN	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Agriculture														
Bolsa SE	2,352	2,517	2,570	2,334	2,252	2,103	3,004	1,837	2,635	2,180	2,417	2,601	1,831	3,315
Hollister East	8,543	9,526	10,685	8,012	6,860	8,315	9,067	9,453	10,832	8,151	8,464	8,784	7,756	9,594
Hollister West	2,128	1,936	2,145	1,509	1,708	1,888	2,190	2,228	3,324	2,584	2,750	2,192	1,338	2,337
Pacheco	4,190	4,469	4,573	3,220	4,304	4,242	4,279	6,148	5,990	4,121	4,658	4,616	4,964	5,663
San Juan	11,496	12,622	12,185	9,581	12,397	11,960	10,009	10,964	14,376	11,183	13,123	13,826	11,916	14,568
Tres Pinos	800	1,004	954	655	670	640	471	641	652	514	1,513	572	468	448
TOTAL	**29,509**	**32,074**	**33,112**	**25,310**	**28,192**	**29,148**	**29,020**	**30,980**	**37,810**	**28,734**	**32,926**	**32,591**	**28,273**	**35,925**
M&I														
Bolsa SE	12	8	7	13	9	0	6	6	4	9	5	25	14	43
Hollister East	3,241	3,280	3,203	2,742	2,570	2,307	2,594	2,608	2,961	2,277	2,334	2,617	2,132	3,790
Hollister West	3,636	3,168	3,361	3,265	2,710	2,555	2,235	2,710	2,796	5,072	2,229	2,254	2,242	4,106
Pacheco	235	234	293	248	323	83	133	227	144	203	176	191	81	241
San Juan	1,356	1,320	1,640	1,375	1,164	1,053	601	793	803	820	590	574	1,479	747
Tres Pinos	2,220	2,336	2,748	2,581	2,648	1,534	2,410	2,710	2,365	2,884	1,676	1,757	2,156	1,606
TOTAL	**10,700**	**10,345**	**11,252**	**10,225**	**9,424**	**7,532**	**7,979**	**9,055**	**9,073**	**11,263**	**7,010**	**7,417**	**8,105**	**10,533**

Table E-4. Historical Water Use by User Type in Zone 6 - Includes Recycled Water (AFY)

WY	Agricultural	Municipal, and Industrial	Total	% Ag
1988	46,366	5,152	51,518	90%
1989	32,387	6,047	38,434	84%
1990	49,663	5,725	55,388	90%
1991	46,640	7,631	54,271	86%
1992	32,210	6,912	39,122	82%
1993	38,878	5,066	43,944	88%
1994	41,854	7,186	49,040	85%
1995	36,399	8,272	44,671	81%
1996	39,845	8,131	47,976	83%
1997	41,482	11,068	52,550	79%
1998	27,526	8,605	36,131	76%
1999	37,203	10,066	47,269	79%
2000	36,062	10,764	46,826	77%
2001	34,035	10,640	44,675	76%
2002	34,354	11,300	45,654	75%
2003	33,533	11,159	44,692	75%
2004	35,597	11,898	47,495	75%
2005	29,510	10,699	40,209	73%
2006	32,074	10,456	42,530	75%
2007	33,112	13,311	46,424	71%
2008	25,310	10,225	35,535	71%
2009	28,192	9,424	37,616	75%
2010	29,148	7,531	36,679	79%
2011	29,020	7,932	36,952	79%
2012	30,980	9,055	40,095	77%
2013	37,810	9,073	46,653	81%
2014	28,734	11,226	39,960	72%
2015	32,926	7,161	39,935	82%
2016	32,591	7,417	40,008	81%
2017	28,273	8,105	36,012	79%
2018	35,925	10,533	46,458	77%
AVERAGE	**34,763**	**8,960**	**43,701**	**79%**

Table E-5. Municipal Water Use by Major Purveyor for Water Year 2018 (AF)

	WY 2018	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Groundwater													
Sunnyslope CWD	**978**	136	141	65	66	31	24	26	47	79	118	138	108
City of Hollister	**1,217**	83	36	25	108	97	98	139	137	144	162	113	74
City of Hollister - Cienega Wells	**121**	10	10	10	10	10	12	11	10	10	11	8	10
San Juan Bautista	**184**	24	19	19	17	-	17	19	22	12	18	10	7
Tres Pinos CWD	**34**	3	2	2	2	2	2	2	3	4	4	4	3
Groundwater Subtotal	**2,533**	**256**	**208**	**120**	**203**	**141**	**152**	**196**	**220**	**249**	**312**	**274**	**202**
CVP Imported Water													
Lessalt Treatment Plant	**1,596**	178	86	92	102	107	102	124	144	169	162	149	181
West Hills Treatment Plant	**1,990**	140	124	127	124	113	124	142	202	207	230	277	179
Imported Water Subtotal	**3,586**	**318**	**210**	**220**	**226**	**220**	**226**	**266**	**346**	**376**	**391**	**425**	**360**
Municipal Total													
Municipal Water Supply Total	**6,119**	**574**	**418**	**340**	**429**	**361**	**378**	**462**	**566**	**624**	**704**	**699**	**562**

Table E-6. Historical Municipal Water Use by Major Purveyor (AFY)

WY	Sunnyslope CWD - GW	City of Hollister - GW	City of Hollister - Cienega Wells[1]	San Juan Bautista	Tres Pinos CWD	Lessalt Treatment Plant	West Hills Treatment Plant	Undivided Total	TOTAL
1988						0		5,152	**5,152**
1989						0		6,047	**6,047**
1990						0		5,725	**5,725**
1991						0		7,631	**7,631**
1992						0		6,912	**6,912**
1993						0		5,066	**5,066**
1994						0		7,186	**7,186**
1995	2,167	2,446				0			**4,613**
1996	2,139	3,386				0			**5,525**
1997	2,638	3,848				0			**6,486**
1998	2,357	3,441				0			**5,798**
1999	2,820	3,558				0			**6,378**
2000	3,214	4,021				0			**7,235**
2001	3,290	3,851				0			**7,141**
2002	3,256	4,120				21			**7,398**
2003	2,053	2,754				2,494			**7,302**
2004	2,426	2,828				2,101			**7,356**
2005	1,959	3,147	123	247	49	1,843			**7,368**
2006	1,907	2,801	123	150	49	1,900			**6,930**
2007	2,413	2,758	123	47	49	1,719			**7,108**
2008	2,294	2,746	123	417	47	1,323			**6,949**
2009	2,251	2,503	123	373	47	1,212			**6,509**
2010	1,861	2,194	108	308	47	1,344			**5,861**
2011	2,225	1,651	80	292	47	1,593			**5,887**
2012	2,360	1,761	130	267	45	1,657			**6,219**
2013	1,655	2,655	120	281	46	1,648			**6,405**
2014	2,134	2,646	114	285	49	979			**6,207**
2015	1,348	1,960	114	225	49	1,364			**5,060**
2016	1,331	1,615	105	232	49	1,682			**5,014**
2017	1,449	1,543	79	249	32	1,940	51		**5,344**
2018	978	1,217	121	184	34	1,596	1,990		**6,119**

1. Data from Hollister Cienega Wells for 2005-2008 was estimated to be the same as WY 2009
Cells with no data indicate that the information is unavailable, while years with no use are shown explicitly as 0's.

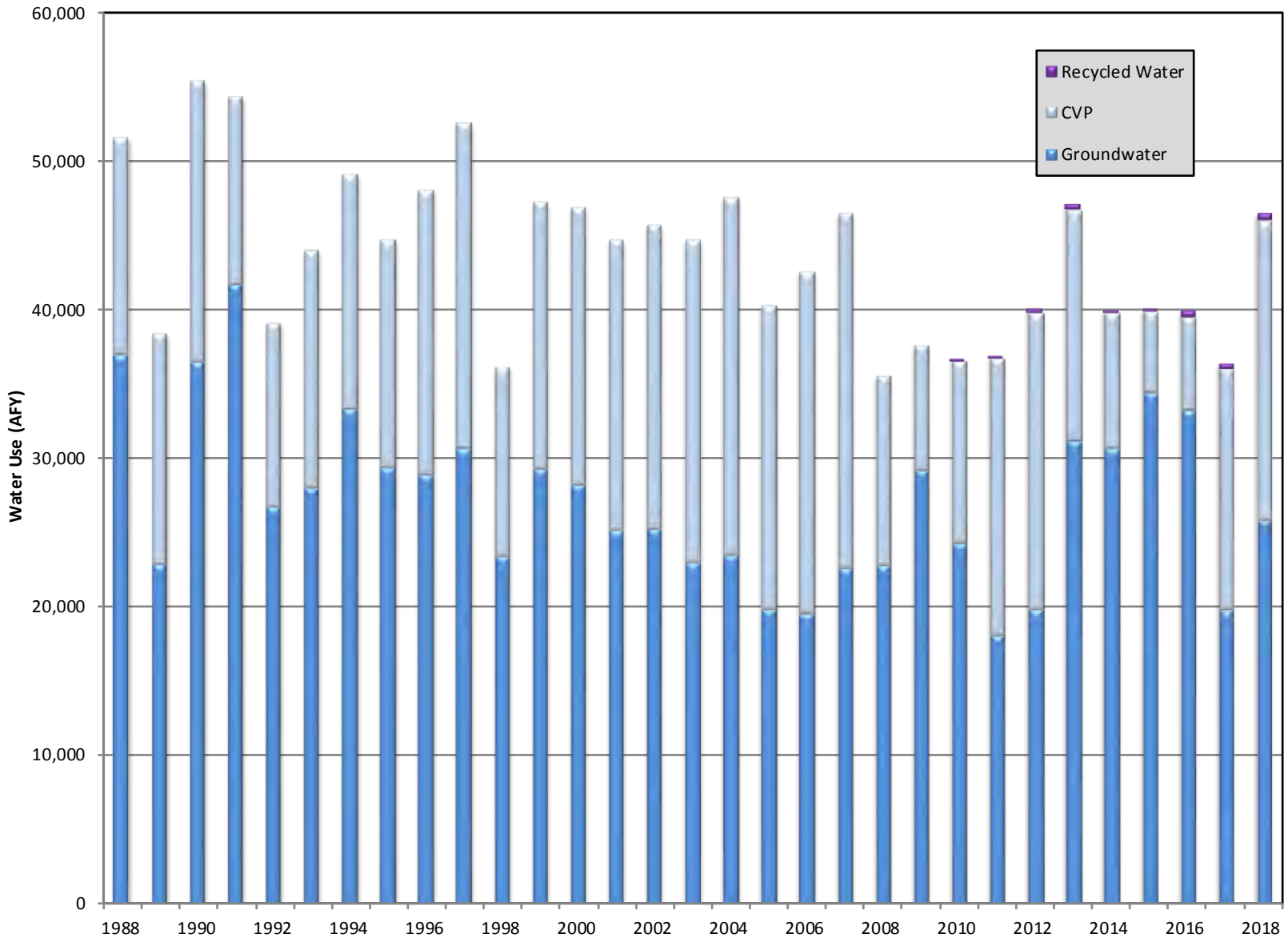

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Figure E-1
Total Water Use by Water Source
Zone 6

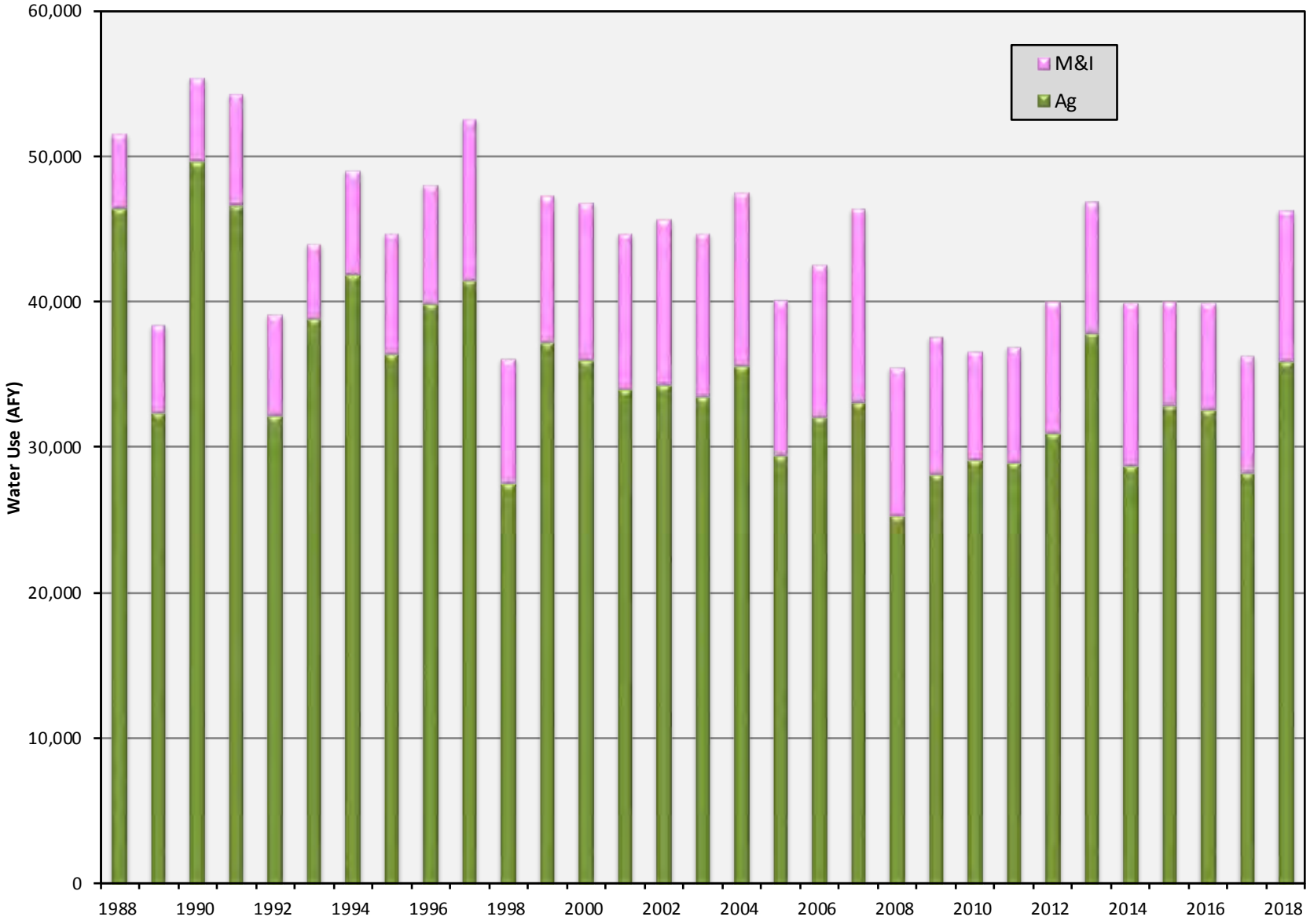

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Figure E-2
Water Use in Zone 6 by User Category

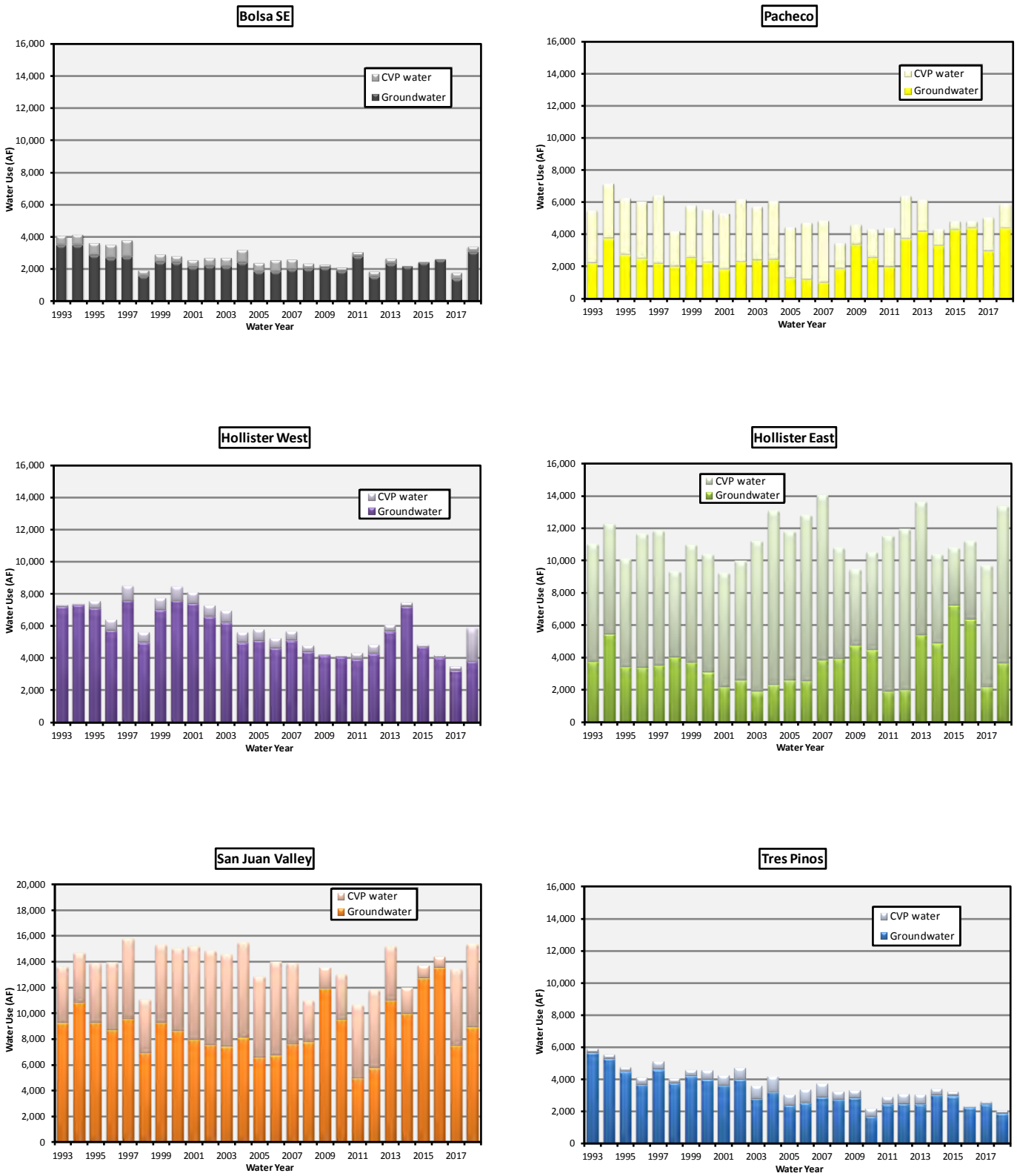

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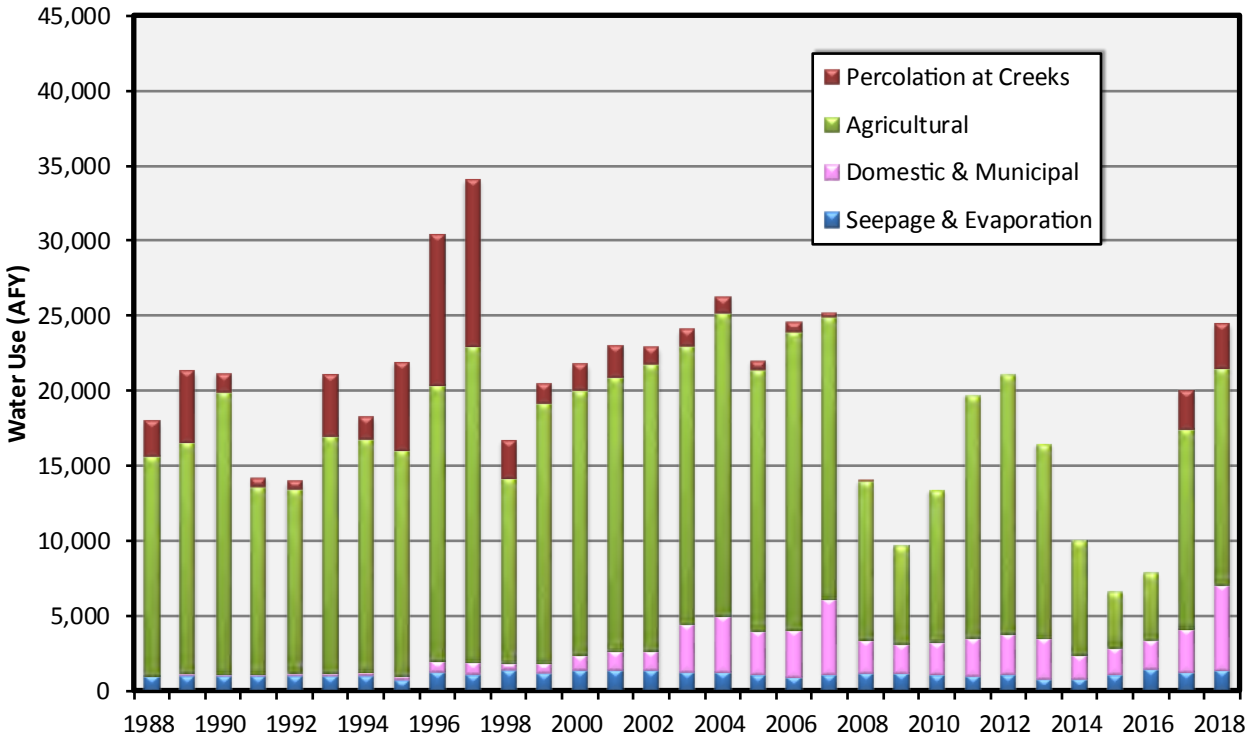
Figure E-3
Total Subbasin Water Use by Water Type



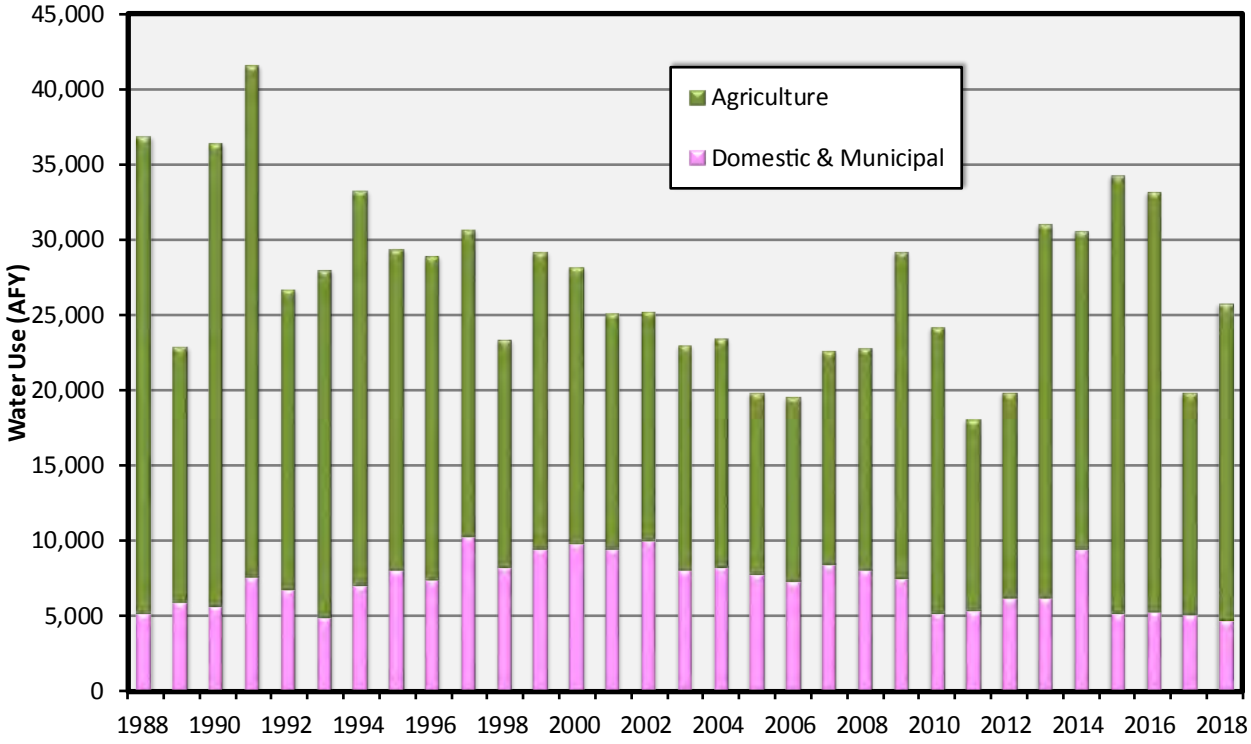


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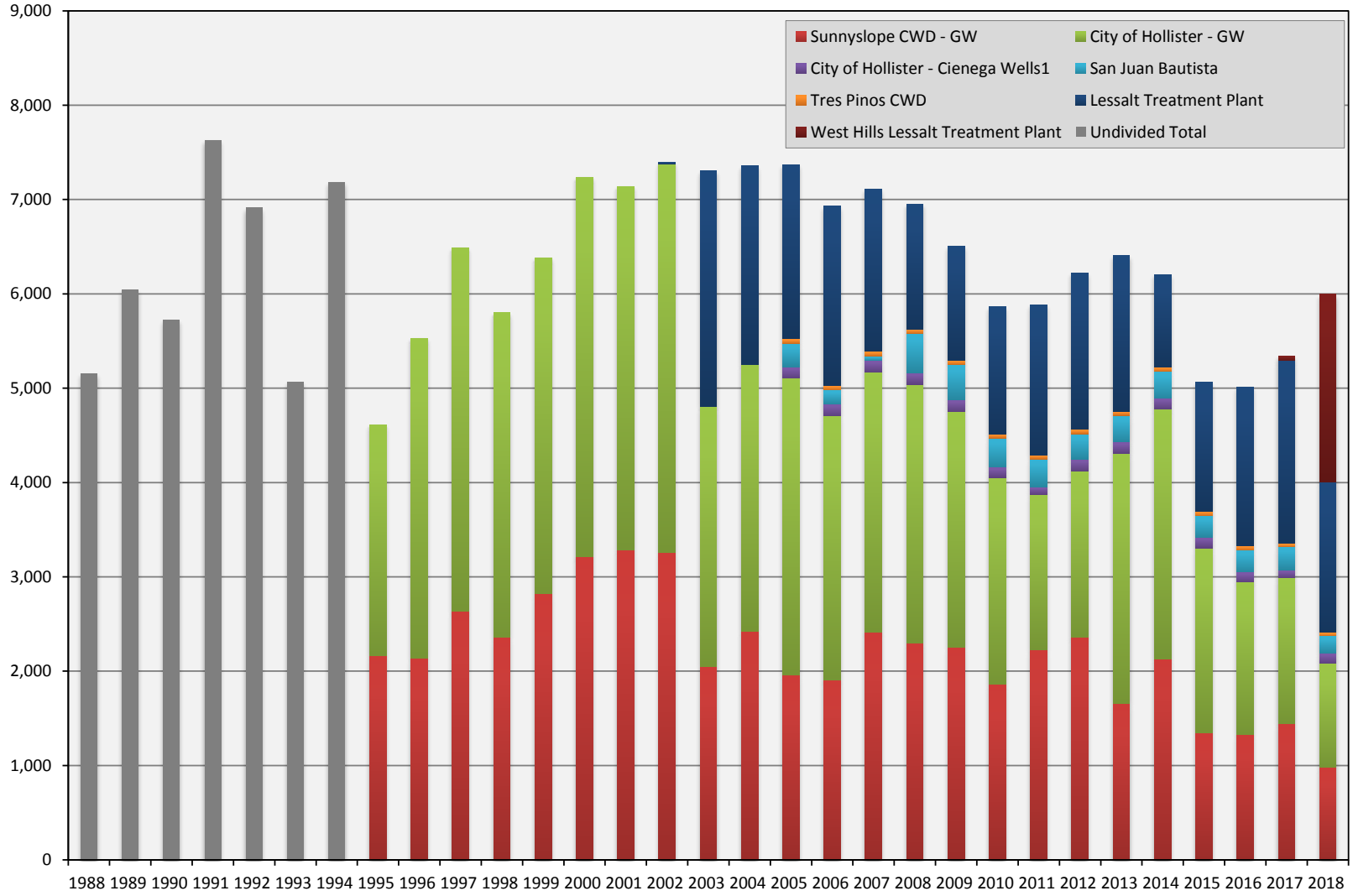
Figure E-4
Annual Total of CVP and Groundwater by Use



December 2018

TODD GROUNDWATER

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Table F-2. Historical and Current San Benito County Water District CVP (Blue Valve) Water Rates

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Table F-1. 2018 Recommended Groundwater Revenue Requirement/Charges

San Benito County Water District
Groundwater Rates
Water Year
2019-2020, 2020-2021, 2021-2022
Zone 6

REVENUE REQUIREMENTS				Rates[2]	
Component	**Rate ($/AF)**	**Quantity (A/F)[1]**	**Amount**	**Ag** (per A/F)	**M & I** (per A/F)
SOURCE OF SUPPLY O&M					
AG	$ 18.68	23,974	$ 447,851	$ 18.68	
M&I	$ 18.68	4,877	$ 91,110		$ 18.68
PERCOLATION COSTS					
Cost of Water					
AG Cost of Water[3]	$ 53.51	2,105	$ 112,612	$ 4.70	
M&I Cost of Water[3]	$ 163.58	428	$ 70,036		$ 14.36
Power Costs					
AG Power Charge for percolation	$ 58.83	2,105	123,812	$ 5.16	
M&I Power Charge for percolation	$ 58.83	428	25,188		$ 5.16
TOTAL				$ 28.54	$ 38.21
Current Groundwater Charge[4] (per acre foot)				$ 7.95	$ 24.25
RECOMMENDED Rate Basis (per acre foot)					
Water Year 2019-2020				**$ 12.74**	**$ 38.21**
Water Year 2020-2021				**$ 13.12**	**$ 39.36**
Water Year 2021-2022				**$ 13.51**	40.54
RECOMMENDED CHARGES (per acre foot)					
Water Year 2019-2020				**$ 12.75**	38.25
Water Year 2020-2021				**$ 13.15**	39.40
Water Year 2021-2022				**$ 13.55**	40.55

Notes:

1 Assumed Volumes
Groundwater usage (based on average of past 4 years)

Ag usage	23,974
M&I usage	4,877
Total	28,851

2 Rates=Revenue Requirements/projected groundwater usage
3 Cost of Water:
AG: USBR and SLDMWA O&M
M&I: USBR and SLDMWA O&M, USBR Out-of-Basin Interest
4 Groundwater charge adopted by San Benito County Water District Board of Directors in January 2017 (Ag) and January 2016 (M&I)
5 Assumed volumes for percolation (based on 3 year average)

Ag	83%	2105
M&I	17%	428
Total	100%	2533

6 Annual escalation rate 3%
7 Rates charged will be rounded up to nearest $.05

Note: Section 70-7.8 (a) of the District Act states that the agricultural rate shall not exceed one-third of the rates for all water other than agricultural water.

Rate Worksheets for 1920 (Groundwater Revenue)

Table F-2. Historical and Current San Benito County Water District CVP (Blue Valve) Water Rates (dollars/af)

USBR Water Year	Standby & Availability Charge (dollars/acre)	Water Charge		Power Charge					Groundwater Charge (dollars/af)			Recycled Water (per AF)	
		Agricultural	Municipal & Industrial	Distribution Subsystem					Agricultural	Municipal & Industrial		Agricultural	Power Charge
				2	6H	9L	9H	Others					
1987	$8.00	$34.00	n.c.						n.i.	n.i.			
1988	$2.00	$34.00	n.c.						n.i.	n.i.			
1991	$4.00	$38.00	$110.00						$6.25	$22.00			
1992	$4.00	$45.00	$120.00						$2.00	$10.00			
1994	$4.50	$77.61	$168.92						$1.00	$5.00			
1995	$4.50	$77.61	$168.92						$1.00	$15.75	First 100 af		
										$36.70	Next 500 af		
										$54.60	Over 600 af		
1996	$6.00	$75.00	$150.00						$1.50	$33.00			
1997	$6.00	$75.00	$157.00						$1.50	$33.00			
1998	$6.00	$75.00	$155.00						$1.50	$33.00			
2000	$6.00	$75.00	$155.00						$1.50	$11.50			
2001	$6.00	$75.00	$155.00						$1.50	$25.00			
2004	$6.00	$75.00	$150.00	$24.30	$46.75	$25.05	$53.70	$15.25	$1.50	$10.00			
2005	$6.00	$80.00	$150.00	$26.15	$49.40	$35.00	$66.90	$17.10	$1.50	$21.50			
2006	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50			
2007	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50			
2008	$6.00	$100.00	$170.00	$17.25	$19.40	$32.60	$62.75	$14.85	$1.50	$21.50			
2009	$6.00	$115.00	$180.00	$17.50	$20.25	$42.55	$74.85	$16.30	$2.50	$22.50			
2010	$6.00	$135.00	$200.00	$22.00	$27.30	$49.75	$84.35	$21.75	$2.50	$22.50			
2011	$6.00	$155.00	$220.00	$22.70	$28.15	$51.25	$86.90	$22.40	$2.50	$22.50			
2012	$6.00	$170.00	$235.00	$23.35	$29.00	$52.80	$89.50	$23.10	$2.50	$22.50			
2013	$6.00	$170.00	$235.00	$40.30	$29.25	$43.05	$91.55	$22.40	$3.25	$23.25			
2014	$6.00	$170.00	$238.00	$41.55	$30.15	$44.35	$94.30	$23.10	$3.60	$23.25			
2015	$6.00	$179.00	$247.00	$42.75	$31.05	$45.70	$97.15	$23.80	$3.95	$23.25			
2016	$6.00	$272.00	$363.00	$123.10	$75.65	$109.95	$162.55	$66.05	$4.95	$24.25		$182.55	$57.70
2017	$6.00	$191.00	$363.00	$126.80	$77.90	$113.25	$167.45	$68.05	$6.45	$24.25		$183.45	$59.45
2018	$6.00	$209.00	$363.00	$130.60	$80.25	$116.25	$172.45	$70.10	$7.95	$24.25		$183.45	$59.45

Notes:

af = acre-feet.
n.c. = no classification.
n.i. = not implemented
All rates effective March 1 through following February.

Table F-3. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

User Category and Cost Item	Irrigation[1]						Municipal & Industrial					
	Cost of service (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]	Cost of service[2] (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]
1994	$71.68	$6.20	n.a.		$77.88	$17.21	$165.67	$12.40	n.a.		$178.07	$85.86
1995	$66.47	$6.35	n.a.		$72.82	$17.21	$132.90	$12.69	n.a.		$145.59	$85.86
1996	$65.63	$6.53	n.a.		$72.16	$27.46	$127.40	$13.06	n.a.		$140.46	$85.86
1997	$69.57	$6.70	n.a.		$76.27	$27.46	$143.27	$13.39	n.a.		$156.66	$85.86
1998	$61.58	$6.88	$5.00		$73.46	$27.46	$130.88	$13.76	$5.00		$149.64	$85.86
1999	$60.30	$6.98	$2.73		$70.01	$27.46	$127.91	$13.96	$2.73		$144.60	$85.86
2000	$64.24	$7.10	$6.43		$77.77	$27.46	$129.59	$14.20	$6.43		$150.22	$85.86
2001	$69.50	$7.28	$2.65		$79.43	$27.46	$129.40	$14.56	$4.15		$148.11	$85.86
2002	$68.71	$7.54	$6.61		$82.86	$24.30	$130.32	$15.08	$6.61		$152.01	$79.13
2003	$72.20	$7.69	$5.46		$85.35	$24.30	$129.07	$15.38	$5.46		$149.91	$79.13
2004	$74.52	$7.82	$6.61		$88.95	$24.30	$134.86	$15.64	$6.61		$157.11	$79.13
2005	$77.10	$7.93	$7.99		$93.02	$24.30	$132.01	$15.87	$7.99		$155.87	$79.13
2006	$91.13	$8.24	$9.31		$108.68	$30.93	$214.41	$16.49	$9.31		$240.21	$77.12
2007	$93.53	$8.58	$9.99	$0.11	$112.21	$30.93	$215.32	$17.15	$9.99	$0.11	$242.46	$80.08
2008[6]	$28.12	$8.79	$10.95	$0.07	$47.93	$30.93	$33.34	$17.57	$10.95	$0.07	$61.68	$33.34
2009	$30.20	$9.06	$11.49	$0.07	$50.82	$30.20	$32.77	$18.12	$11.49	$0.07	$62.45	$32.77
2010	$33.27	$9.11	$11.91	$0.11	$54.40	$33.27	$36.11	$18.23	$11.91	$0.11	$66.36	$36.11
2011	$38.92	$9.29	$9.51	$0.05	$57.77	$38.92	$42.58	$18.59	$9.51	$0.05	$70.73	$42.58
2012	$39.71	$9.39	$15.20	$0.05	$64.35	$39.71	$37.95	$18.78	$15.20	$0.05	$71.98	$37.95
2013	$40.39	$9.79	$17.29	$0.05	$67.52	$39.91	$38.71	$19.58	$17.29	$0.05	$75.63	$40.92
2014	$46.87	$9.99	$28.81	$0.23	$85.90	$46.87	$29.70	$19.98	$28.81	$0.23	$78.72	$29.70
2015	$53.82	$10.07	$30.66	$0.23	$94.78	$53.82	$34.74	$20.14	$30.66	$0.23	$85.77	$34.74
2016	$85.12	$10.07	$30.66	$0.23	$126.08	$53.82	$61.24	$20.14	$30.66	$0.23	$112.27	$34.74
2017	$91.57	$10.23	$14.15	$0.30	$90.85	$39.90	$49.50	$20.45	$14.15	$0.30	$84.40	$22.85
2018	$85.13	$10.47	$20.39	$0.30	$107.87	$48.35	$21.42	$20.94	$20.39	$0.30	$63.05	$17.45

Notes:

(1) Total USBR rate given for non-full cost users only, as they represent the majority of water users.

(2) Cost-of-service for agricultural and municipal and industrial users includes a capital repayment rate and an operation and maintenance (O&M) rate. For municipal and industrial customers, cost-of-service also includes a deficit charge, which includes interest on unpaid O&M and interest on capital and on unpaid deficit.

(3) Restoration fund charges apply October 1 through September 30.

(4) Beginning in 1998, the San Luis-Delta Mendota Water Authority instituted this charge to "self-fund" costs associated with maintaining the Delta-Mendota Canal and certain other facilities, which were formerly funded directly by the Bureau of Reclamation. SLDMWA issues preliminary rates in December for the upcoming contract year (March-February). These rates are used for rate-setting purposes; actual rates may vary.

(5) The contract rate is the minimum rate CVP contractors are allowed to pay. To the extent that the contract rate does not cover interest plus actual operation and maintenance costs, a contractor deficit is accumulated that is charged interest at the current-year treasury borrowing rate.

(6) Per the amendatory contract with the USBR "out of basin" capital costs that were previously included in the cost of service are now under a separate repayment contract.

(7) Cost of service rates are inclusive of USBR direct pumping and Project Use Energy costs.

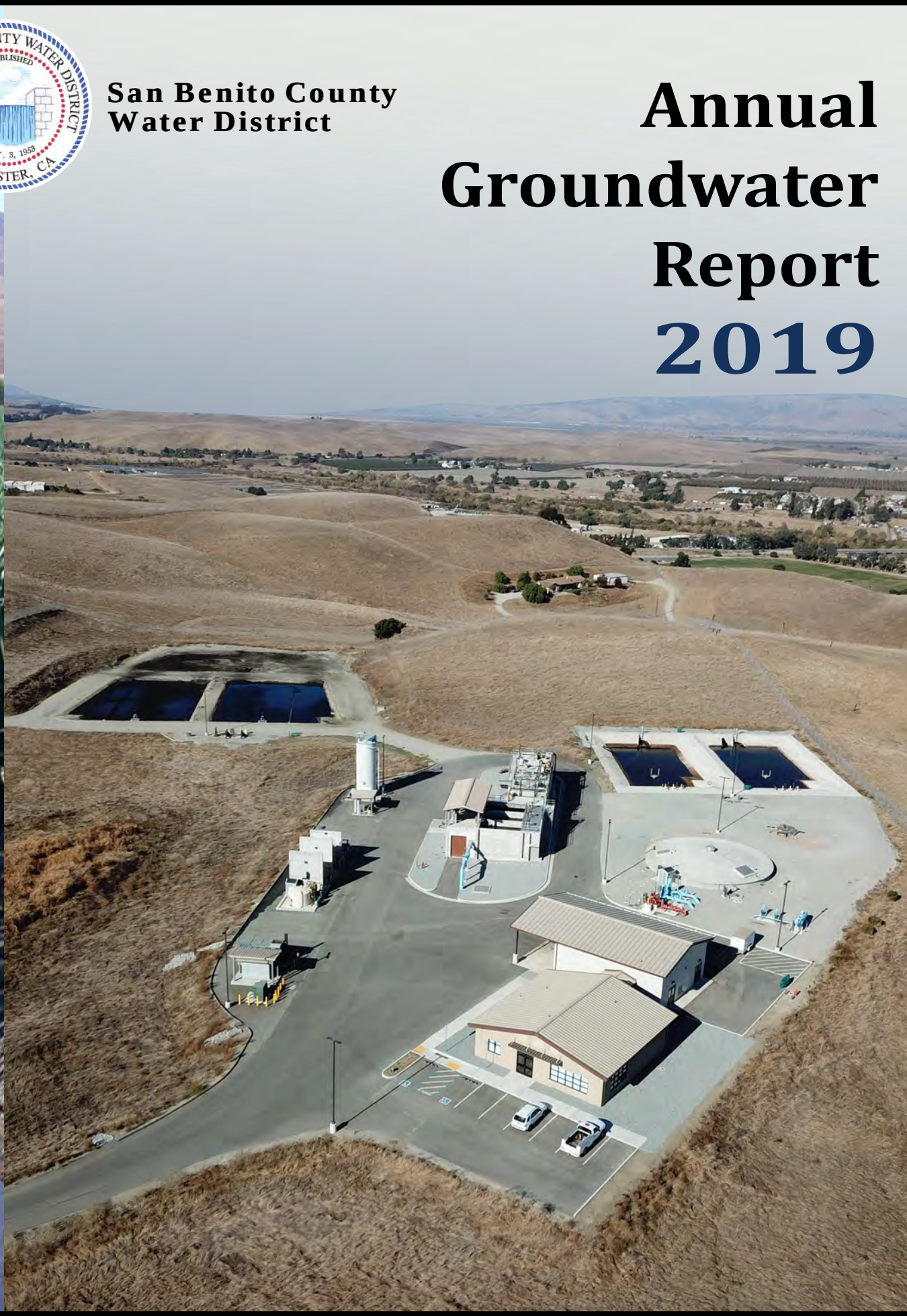
APPENDIX G LIST OF ACRONYMS

List of Acronyms

AF or A/F	acre-foot
AFY	acre-foot per year
AG	agriculture
BMP	Best Management Practices
CASGEM	California Statewide Groundwater Elevation Monitoring
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
COC	Constituent of Concern
CVP	Central Valley Project
District or SBCWD	San Benito County Water District
DWR	California Department of Water Resources
DWTP	Domestic Wastewater Treatment Plant
ET	evapotranspiration
ft	feet
gpd	gallons per day
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GW	groundwater
IRWMP	Integrated Regional Water Management Plan
ITRC	Irrigation Training and Research Center, California Polytechnic State University
IWTP	Industrial Wastewater Treatment Plant
M&I	Municipal and Industrial
MGD	million gallons per day
msl	mean sea level
NGVD	National Geodetic Vertical Datum
pdf	Adobe Acrobat Portable Document Format
PPWD	Pacheco Pass Water District
PVWMA	Pajaro Valley Water Management Agency
RW	recycled water
RWQCB	Regional Water Quality Control Board
SCVWD	Santa Clara Valley Water District
SEIR	Supplemental Environmental Impact Report
SGMA	Sustainable Groundwater Management Act
SLDMWA	San Luis & Delta-Mendota Water Authority
SSCWD	Sunnyslope County Water District
USBR	U.S. Bureau of Reclamation
UWMP	Urban Water Management Plan
WRA	Water Resources Association of San Benito County
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WY	water year

San Benito County Water District

Annual Groundwater Report 2019



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ANNUAL GROUNDWATER REPORT

December 2019

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EXECUTIVE SUMMARY

This Annual Groundwater Report for San Benito County Water District (District) describes groundwater conditions in the San Benito County portions of the North San Benito Subbasin of the Gilroy-Hollister Basin. Consistent with past reports, this Annual Report focuses on the District's Zone 6, the zone of benefit for importation of Central Valley Project (CVP) water supply. The Report is prepared at the request of the District Board of Directors and is consistent with the special act of the State that established the District. It documents water sources and uses, groundwater elevations and storage, and management activities for Water Year 2019 and it provides recommendations. Water Year 2019 was characterized by higher than average rainfall, above average CVP allocations, and stable to slightly increased groundwater storage in parts of the basin and stable groundwater storage in the other areas.

This Water Year, the District successfully requested that the Department of Water Resources (DWR) combine three separate subbasins of the Gilroy-Hollister Basin (Bolsa, Hollister, and San Juan) with the Tres Pinos Valley basin to form the new North San Benito Groundwater Subbasin. Portions of the new Subbasin extend into Santa Clara County; the entire Llagas Subbasin of the Gilroy-Hollister Basin is in Santa Clara County. The District is the exclusive Groundwater Sustainability Agency (GSA) for the San Benito portion of North San Benito Subbasin and Santa Clara Valley Water District (SCVWD) is GSA for Santa Clara portions. The District is leading preparation of the Groundwater Sustainability Plan (GSP) in cooperation with SCVWD and in compliance with the Sustainable Groundwater Management Act (SGMA). Upon adoption by the District and SCVWD boards, the GSP will provide the information and tools for continued groundwater management. After completion of the GSP, the District will be required to submit Annual GSP Reports to DWR. This 2019 Annual Groundwater Report begins a transition to an annual groundwater report that meets the requirements of the District Act and satisfies SGMA requirements. This includes expanding the report coverage to address the entire North San Benito Subbasin.

The Annual Groundwater Report for Water Year 2019 includes a triennial update of the water quality database and assessment of water quality; this is the fifth triennial update as planned originally in 2006. Water quality did not change significantly during 2017-2019, although some areas of the basin continue to have elevated levels of TDS and nitrate. Water quality monitoring will continue consistent with existing District management objectives and will be transitioned over the next two years to conform with the District Act and with SGMA.

The District has effectively managed water resources in San Benito County for decades. Working collaboratively with other agencies, the District has eliminated historical overdraft, developed and managed multiple sources of supply, established an effective water conservation program, protected water quality, and provided annual reporting. Water Year 2019 witnessed a continuation of these collaborative efforts. The continued partnership of the Hollister Urban Area (including the District, City of Hollister, and Sunnyslope County Water District (SSCWD)) resulted in increased water treatment capacity that significantly enhances opportunities for conjunctive use of CVP and groundwater and improves delivered water quality for municipal costumers. The District has also worked directly with well owners to supplement the groundwater elevation monitoring network and fill data gaps identified in the GSP process. The District's continued public outreach—including preparation of Annual Groundwater Reports—has been an asset to the GSP process and is a foundation for future groundwater management.

1-INTRODUCTION

The San Benito County Water District (District or SBCWD) was formed in 1953 by a special act (District Act) of the State with responsibility and authority to manage groundwater. The District Act authorizes the Board of Directors to require an annual investigation and report on groundwater conditions of the District and its zones of benefit, such as Zone 6, the area for distribution of Central Valley Project (CVP) water. As documented in **Appendix A,** the District Act specifies the minimum content of the report should the District choose to prepare one. Annual Reports have been prepared historically to analyze the status of the groundwater basin, to evaluate conditions in the next year, and to provide management recommendations.

With passage of the Sustainable Groundwater Management Act (SGMA) in 2014, the State has created a new framework for groundwater basin management, monitoring, and reporting by local agencies. The District has responded proactively. The District is the exclusive Groundwater Sustainability Agency (GSA) for the North San Benito Groundwater Basin in San Benito County shown on **Figure 1-1**. This basin was formerly defined as three separate subbasins of the Gilroy-Hollister basin and the Tres Pinos Valley basin. The District is currently preparing a Groundwater Sustainability Plan (GSP) for the North San Benito Basin in cooperation with Santa Clara Valley Water District (SCVWD), which is the GSA for the small portions of the basin within Santa Clara County. As proposed in the GSP, the North San Benito Groundwater Basin can be divided into four management areas, shown in **Figure 1-2**. These management areas are designed to facilitate implementation of the GSP. In Water Year 2019, the District and Todd Groundwater have completed several sections of the plan, participated in two public workshops, and four Technical Advisory Committee meetings.

Consistent with the District Act and prepared at the request of the District, this Annual Report documents water supply sources and use, groundwater elevations and storage, and District management activities from October 2018 through September 2019. It fulfills the minimum content for a District Annual Report and presents an overview of the state of the groundwater basin with recommendations for management. It conveys considerable information, including tables and figures, which are provided largely in **Appendices B through E**. **Appendix F** provides information on water rates and charges and **Appendix G** contains a list of acronyms.

The 2019 Annual Groundwater Report strives to maintain consistency with past Annual Reports while also providing a path to fulfill future requirements for SGMA Annual Reports. As development of the GSP proceeds over the next two years (with completion before January 31, 2022), the SBCWD Annual Reports may be modified further to ensure compliance with SGMA. While complying with GSP regulations, Annual Reports will also adhere to requirements for SBCWD annual reporting, as described in the District Act.

Acknowledgments

This report was prepared by Iris Priestaf, PhD, Maureen Reilly, PE, Arden Wells, and Chad Taylor, PG, CHG of Todd Groundwater. We appreciate the assistance of San Benito County Water District staff, particularly Jeff Cattaneo, Sara Singleton, Garrett Haertel, and David Macdonald.

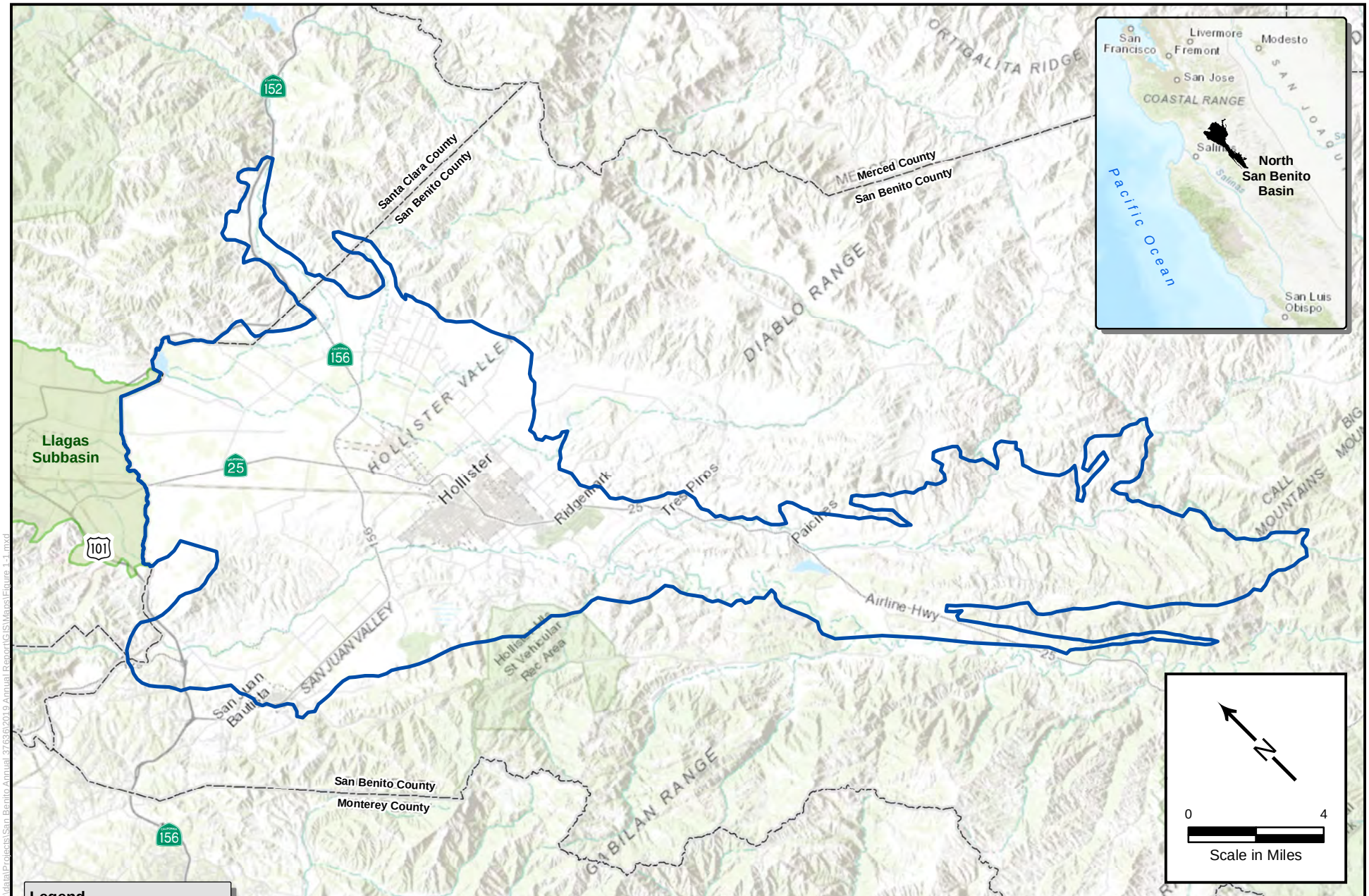

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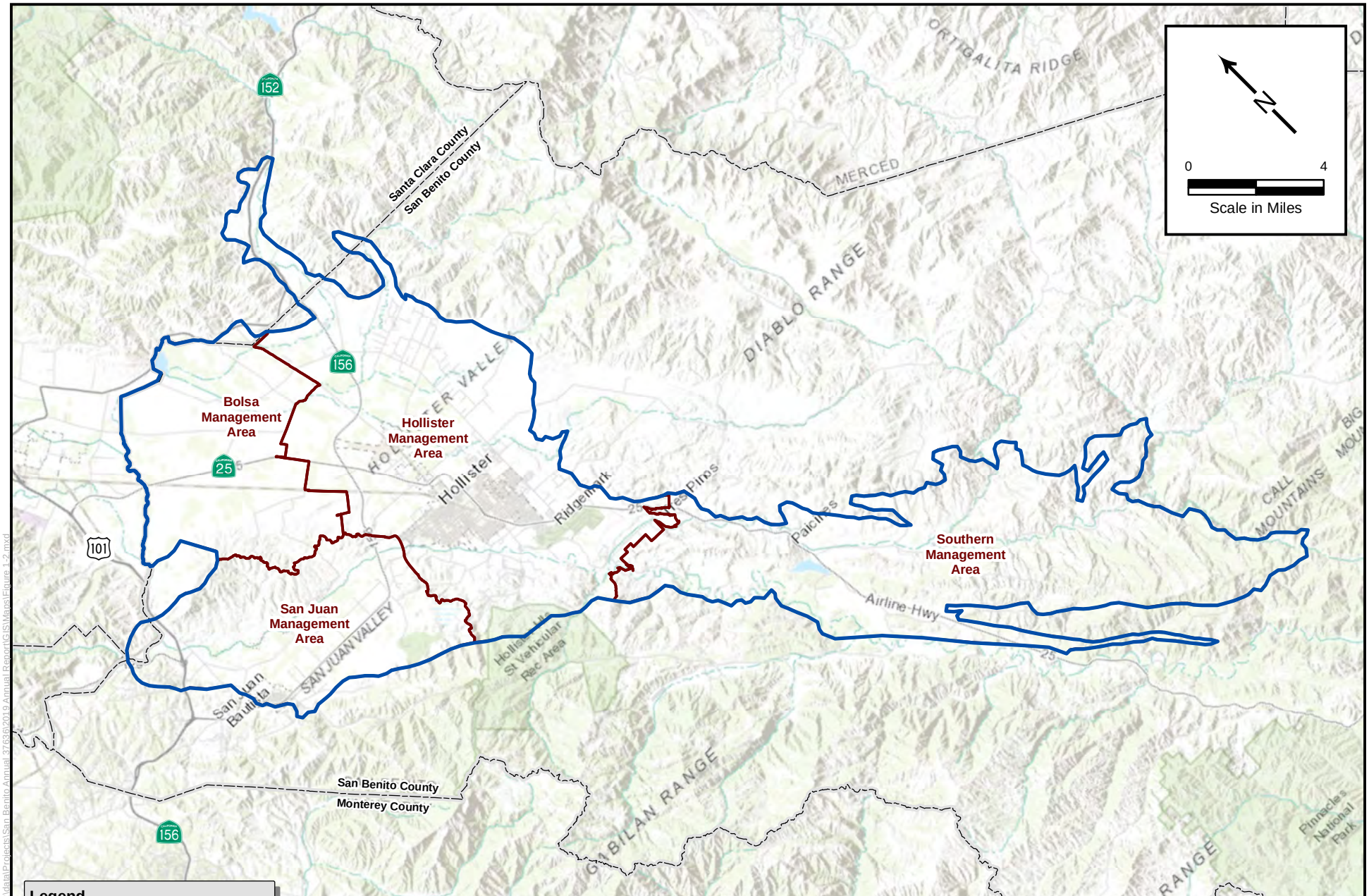
Figure 1-1
North San Benito Groundwater Basin



Legend

- North San Benito Basin
- Proposed Management Areas
- California County

December 2019

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Figure 1-2
Proposed GSP Management Areas

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2 – GEOGRAPHIC AREA

The geographic area and boundaries of local groundwater basins have been defined differently by the District and by the California Department of Water Resources (DWR) for their specific purposes. Like previous annual reports, this Annual Report focuses on the San Benito County portions of the Gilroy-Hollister Groundwater Basin, including the previously-defined Bolsa, Hollister, and northern San Juan Bautista subbasins. Nonetheless, it is recognized that the North San Benito Basin (Basin)[1] includes portions in Santa Clara County and that it extends farther to the south; the entire basin is the subject of the GSP. To support a transition to SGMA, the monitoring program is being improved and expanded.

District-Defined Subbasins

For the past 24 years, the Annual Reports have focused on subbasins delineated in 1996 and based on hydrogeologic and other local factors (e.g., Zone 6 boundaries). These subbasins are shown in **Figure 2-1** in light blue. Six of these subbasins are defined within Zone 6, including Bolsa Southeast (SE), Pacheco, Hollister East (North and South), Tres Pinos, Hollister West, and San Juan subbasins. The seventh is the Bolsa subbasin; of the subbasins shown on the map, only the Bolsa subbasin receives no direct CVP deliveries and relies on local groundwater.

DWR-Defined Basins

As the District proceeds with SGMA planning and implementation, its area of focus is changing from the 1996-defined subbasins and Zone 6 to the North San Benito Basin and GSP area outlined in **Figure 1-1**, in dark blue. All groundwater basins defined by DWR as wholly or partially in San Benito County are shown in **Figure C-1** in **Appendix C.**

Over the next few years, the annual report will transition from analyses on the basis of subbasins to management areas, shown in red on **Figure 1-2**. The four proposed Management Areas (MAs) have been defined as part of the GSP process to facilitate implementation. A major factor in defining MAs is availability of water sources (e.g., CVP) and Zone 6. While recognizing that water supply availability (in terms of sources, infrastructure, and institutional arrangements) can change in the future, current availability is a reasonable starting point. SBCWD provides local surface water from Hernandez and Paicines reservoirs that is provided to a local zone of benefit, Zone 3, and imported Central Valley Project (CVP) water that is provided to Zone 6. The District-defined subbasins also relied on Zone 6 as a boundary and thus the District-defined subbasins generally fall within the boundaries of the MAs.

[1] The official nomenclature is North San Benito Subbasin of the Gilroy Hollister Basin; it has been assigned DWR Basin Number 3-003.05. For the purposes of this report, it is referred to as North San Benito Basin to clearly differentiate it from previous DWR-defined subbasins and from previous SBCWD-defined subbasins.

2 – GEOGRAPHIC AREA

The four Management Areas (MAs) are listed below with District-defined subbasins that they generally encompass:

- Southern MA
- Hollister MA (includes Tres Pinos, Hollister East and West, Bolsa SE, Pacheco subbasins)
- San Juan MA (includes almost all District-defined San Juan subbasin)
- Bolsa MA (includes almost all previously-defined Bolsa subbasin)

Hollister and San Juan MAs include portions of Zone 6; Southern and Bolsa MAs do not.

Ongoing District Monitoring Programs

Data from monitoring programs undertaken by local, state, and federal agencies are summarized below as currently incorporated in the Annual Report. The District data compilation and monitoring programs are likely to be expanded and revised in the future as data needs are identified in the GSP, for example to address topics such as potential subsidence, and to represent the entire North San Benito Basin.

Climate. Climate data are regularly compiled from DWR's California Irrigation Management Information System (CIMIS) and include: total solar radiation, soil temperature, air temperature/relative humidity, wind direction, wind speed, and precipitation. Additional precipitation data are available from the WRCC station at Hollister from 1934-2019 (WRCC 2019). For the Annual Groundwater Reports, historical annual precipitation has been compiled and reported using the Hollister rain gage for the long-term precipitation and the CIMIS San Benito station for recent monthly precipitation. Monthly precipitation and evapotranspiration for the Hollister #126 CIMIS station are tabulated in **Appendix B**.

Groundwater levels. SBCWD has had a semi-annual groundwater level monitoring program since Water Year (WY) 1977; groundwater level data gathered by USGS and other agencies are available as early as 1913 (Clark, 1924). The Annual Groundwater Reports provide quarterly groundwater level data in **Appendix C** for each year. The data are the basis for groundwater level contour maps, change maps, hydrographs, groundwater level profiles, and storage change computations presented in the Annual Reports. The SBCWD monitoring program includes wells in the Pacheco Valley in Santa Clara County. SCVWD's monitoring program provides data for the southern Llagas Subbasin; these shared data are used in the SBCWD annual groundwater level maps.

SBCWD is the designated CASGEM monitoring agency for the GSP Area; CASGEM data are available from DWR's online Groundwater Information Center Interactive Map (GICIMA).

Water quality. In 1997, SBCWD initiated a program for monitoring nitrate and electrical conductivity (EC) in wells. In 2004, SBCWD established a comprehensive water quality database that records from all water systems and regulated facilities. The database has been updated this year as part of the triennial Annual Report update. Monitoring for the Salt and Nutrient Management Plan is closely coordinated. State-wide sources of groundwater quality data include the Water Data Library (WDL), Geotracker/GAMA program, and the State Water Resources Control Board's Division of Drinking Water.

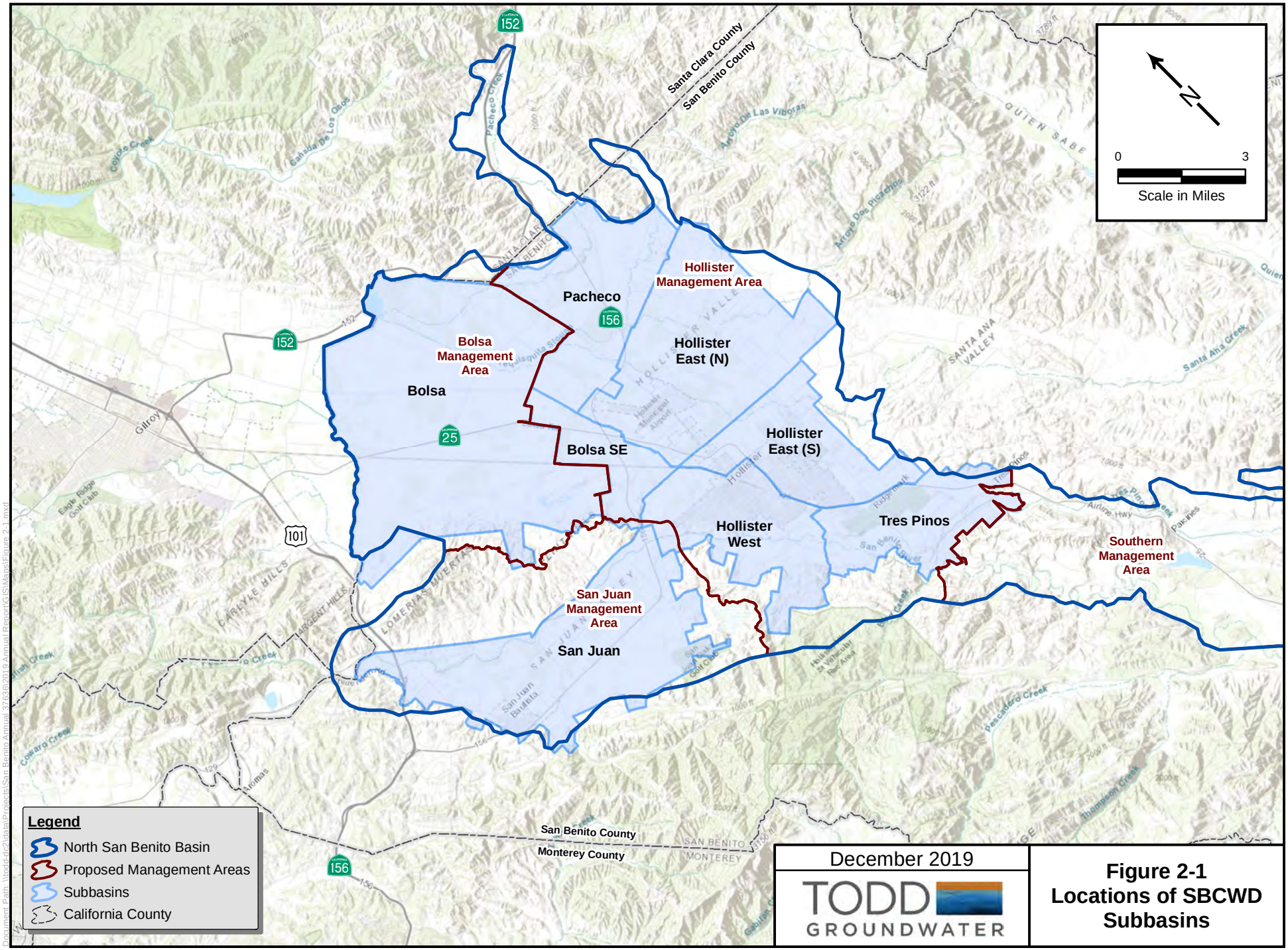
These are accessed for the triennial update of the SBCWD Water Quality Database; available data are shown in **Appendix C**, and water quality conditions are presented in Section 3.

Reservoirs. The Annual Report summarizes reservoir water budget information for Hernandez, Paicines, and San Justo reservoirs and provides annual total releases from Hernandez and Paicines reservoirs from Water Year 1996 to present. Reservoir storage and release data are available in **Appendix D**.

Surface water flows and percolation. Surface water monitoring and percolation are summarized in **Appendix D** of the Annual Groundwater Reports. For Water Year 1994 to present, percolation of imported CVP water is documented in **Table D-3** and percolation of wastewater is shown in **Tables D-4 and D-5**. The District temporally suspended its surface water monitoring network but plans to relaunch the monitoring in Water Year 2020.

Wells and groundwater pumping. SBCWD monitors groundwater pumping in Zone 6. Pumping amounts are calculated semiannually by metering the number of hours of pump operation and multiplying by the average discharge rate. This monitoring program began in about 1990 (soon after CVP imports started) and was based on recognition that CVP imports resulted in reduced pumping, increased recharge, and sustainable groundwater storage with regional benefits to groundwater users. Irrigation pumping beyond Zone 6 is not monitored but has been estimated for regular water budget updates based on land use information and water use factors. Groundwater pumping estimates for Zone 6 are summarized by major use category and subbasin in **Appendix E**, which also provides information on CVP use in Zone 6.

Units and accuracy. Throughout this report, water volumes and changes in storage are shown to the nearest acre-foot (AF). These values are accurate to one to three significant digits (depending on the measurement). All digits are retained in the text to maintain as much accuracy as possible during subsequent calculations, but results should be rounded appropriately.



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TODD GROUNDWATER

Figure 2-1
Locations of SBCWD Subbasins

3-GROUNDWATER CONDITIONS

The Annual Report summarizes basin conditions including climate, groundwater elevations, groundwater storage, and groundwater level trends. Overall, Water Year 2019 was an above average hydrologic year, and CVP allocations remained above average.

Climate

Assessment of climatic conditions begins with collection of climate data (rainfall and evapotranspiration), which are summarized in **Appendix B**. Local rainfall amounts are compiled on a monthly basis and reviewed as an increasingly variable factor that affects basin inflows (e.g., deep percolation) and outflows (groundwater pumping). Recognizing that drought often is extensive across California, local dry years also may be indicative of regional drought and reduced CVP allocations. Dry years often are characterized by increased groundwater pumping for agricultural irrigation to offset lack of rainfall and reduced CVP allocations.

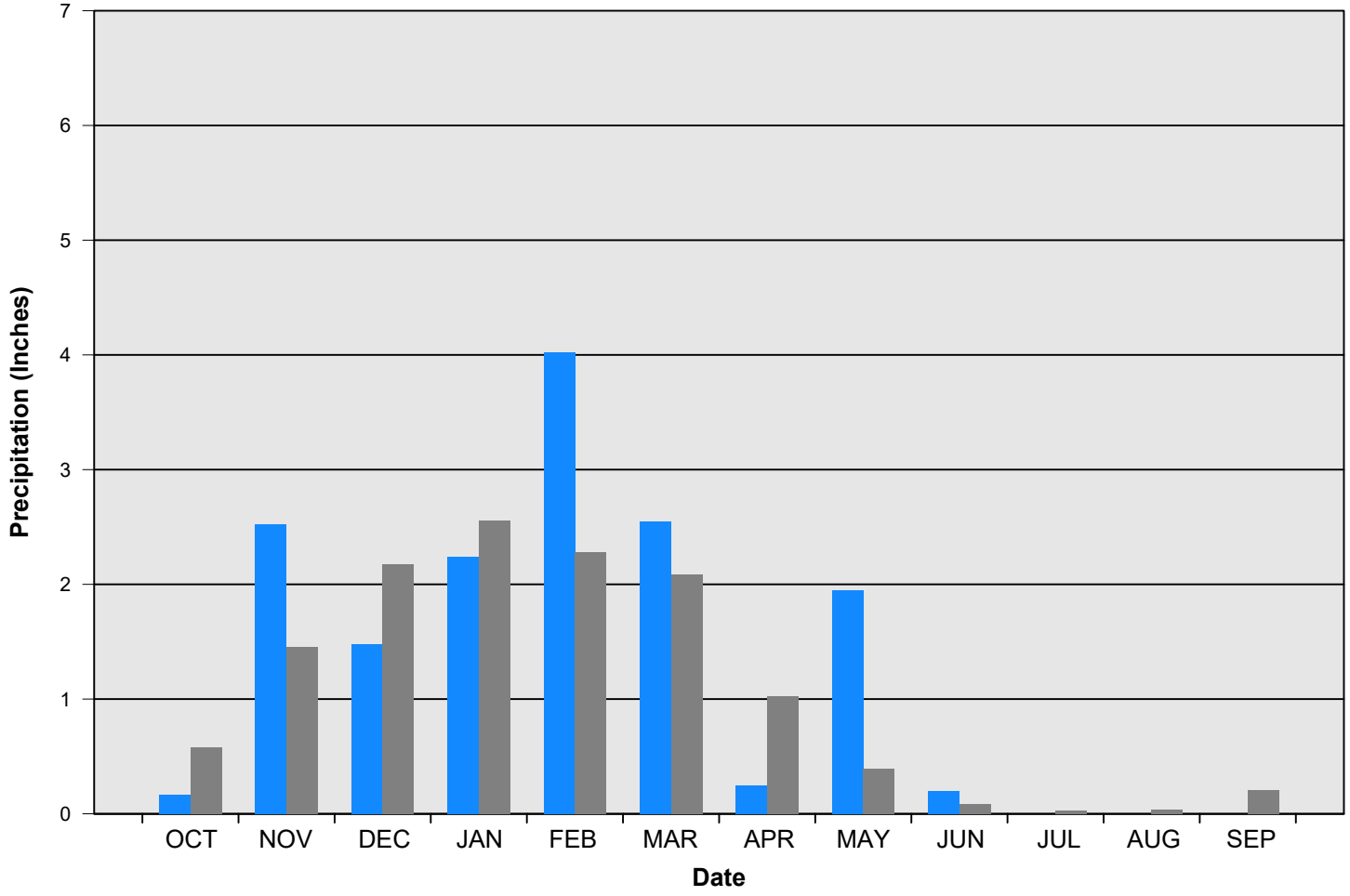
In 2019, overall precipitation was 15.38 inches as shown in **Figure 3-1**; November and early spring received higher than normal precipitation. Monthly rainfall and evapotranspiration data can be found in **Appendix B**. Water year 2019 was 116 percent of normal, reflecting an above-normal year. **Figure 3-2** shows annual precipitation and water year type from 1976 through 2019. The basin is still recovering from the extreme drought of 2013, 2014, and 2015 and from low CVP allocations for 2013 through 2016; additional inflow from this above-normal year will help replenish groundwater reserves. NOAA's weather forecast for the winter 2019-2020 predicts a 25 to 50 percent chance of less than average rainfall for the central coast region (NOAA 2019).

The Annual Report has relied on CIMIS station #126 since Water Year 1995. The station, located in Hollister, is hosted by the District and maintained by DWR. In recent years, precipitation data have been affected by periodic irrigation overspray that has been recorded on the sensors, including October and November 2018. The District has resolved this problem.

Groundwater Elevations

In October 2019, the District collected groundwater elevations in 103 wells from their existing network and 20 additional wells. The newly selected wells will be added to the network after the reference points have been surveyed. **Figure 3-3** shows the well locations in the current monitoring network and the groundwater elevation contours for October 2019.

Groundwater elevations have generally risen throughout the basin over 2019, except for northern portions of Bolsa and San Juan. Overall, the basin is still recovering from the most recent drought (2013-2016) but at a slower rate than in the wet year of 2017. More information is in **Appendix C.**



2019 - (15.38 in)

Average - (12.9 in)

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Figure 3-1
Water Year 2019
Precipitation

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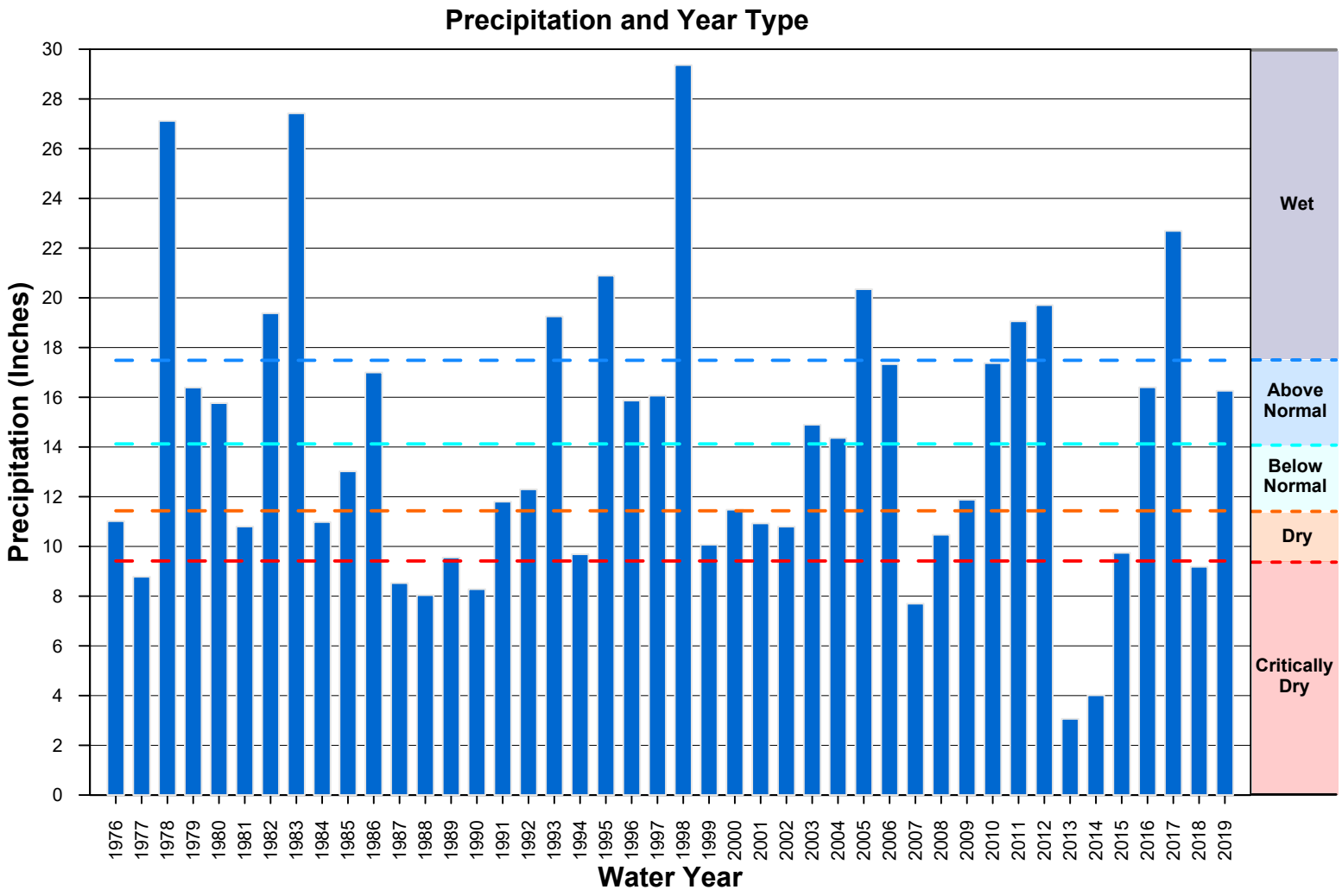

December 2019

TODD GROUNDWATER

Figure 3-2
Annual Precipitation
1976-2019

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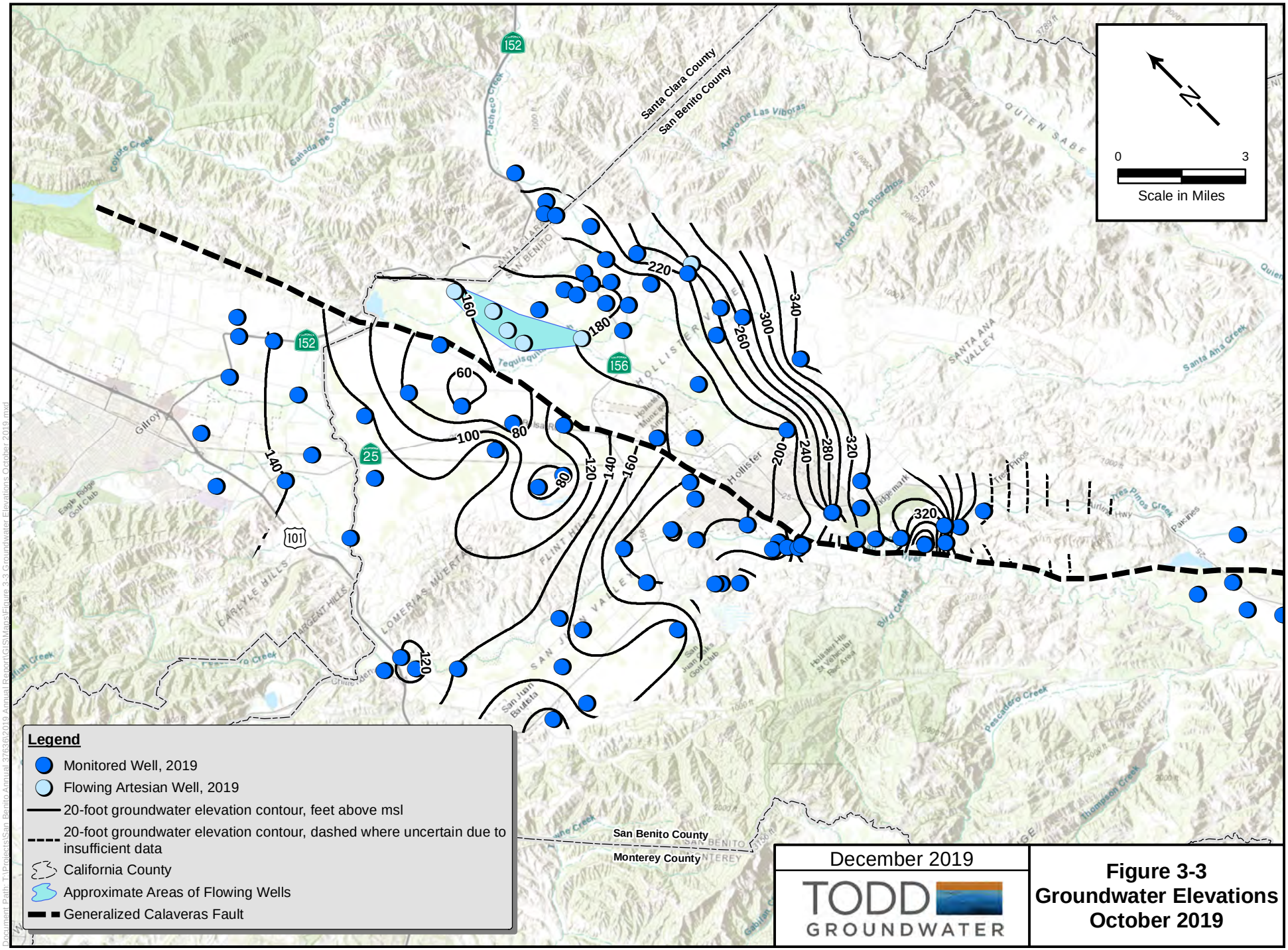


Figure 3-3
Groundwater Elevations
October 2019

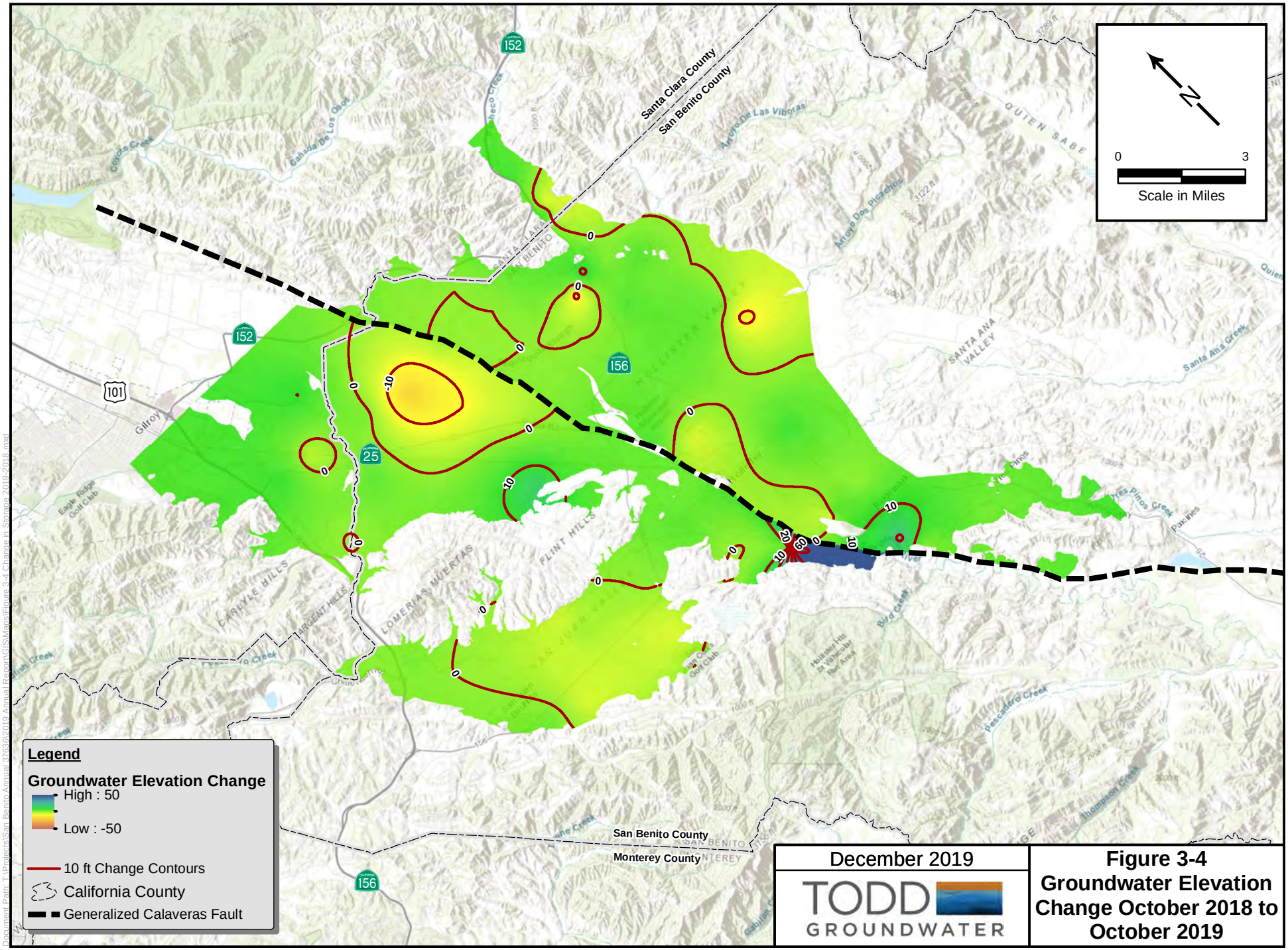
Change in Storage

Groundwater elevation changes from October 2018 to October 2019 were used to evaluate the change in storage. **Figure 3-4** displays change data spatially with a color ramp (see legend), ranging from red that would indicate as much as a 50-foot decline in groundwater levels to blue that indicates a 50-foot or more increase in storage. Groundwater levels and storage continue to recover across the basin. Most areas have shown slight increases (less than 20 feet) from 2018, except portions of Bolsa and San Juan.

Change in storage is the net volume of water added to or removed from the basin over the water year. The change in storage was calculated using the change in groundwater elevations (feet) and multiplying by the total area (acres) to determine the total bulk change in volume. This bulk volume of change was then multiplied by the average storativity of the subbasin to represent the amount of water that a given volume of aquifer will produce. The storativity values for each subbasin were derived from previous numerical models of the basin and continue to be used for consistency with previous Annual Reports. However, the new numerical model developed for the GSP can calculate storage change volumetrically (inflow-outflow) and its estimate may vary from these results. **Table 3-1** documents the change in groundwater storage; as in previous Annual Reports, change in storage is reported on the basis of the 1996 District-defined subbasins, Zone 6, and the total of these subbasins.

Table 3-1. 2019 Change in Groundwater Storage

Subbasin	Subbasin Area (Acres)	Average Change in Groundwater Level (feet)	Change in Volume (Acre-Feet)	Average Storativity	Change in Storage (Acre-Feet)
San Juan	11,708	-1.74	-20,329	0.05	-1,016
Hollister West	6,050	6.49	39,248	0.05	1,962
Tres Pinos	4,725	15.03	71,044	0.05	3,552
Pacheco	6,743	1.79	12,074	0.03	362
Northern Hollister East	10,686	0.63	6,772	0.03	203
Southern Hollister East	5,175	2.35	12,178	0.03	365
Bolsa SE	2,691	3.23	8,694	0.08	695
TOTAL ZONE 6			**129,680**		**6,124**
Bolsa	20,003	-0.56	-11,201	0.01	-112
TOTAL SUBBASINS			**118,479**		**6,012**



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TODD GROUNDWATER

Figure 3-4
Groundwater Elevation Change October 2018 to October 2019

Groundwater Trends

Long term changes in groundwater elevations are illustrated in hydrographs of key wells, shown on **Figure 3-5**. These wells and other representative wells were selected based on length of monitoring record, recent monitoring, and trends similar to regional observed patterns.

Southern Management Area. While the District began monitoring selected wells in 2001, groundwater elevation data are limited in the Southern MA. Available data in Southern Well 14-7-20K shows trends similar to other MAs; groundwater elevations reached a local maximum in the wet year 2006, decreased during the most recent drought (2013-2015), and continued to recover in 2019. Groundwater elevations are about 400 feet higher than elevations in the Hollister MA about nine miles away, reflecting the topography and northward groundwater flow direction.

San Juan Management Area. While some wells in the San Juan MA show variation, especially with declines during the drought, well 12-4-17L20 located near the outflow of the basin has held a consistent elevation. The most recent drought and the dry year of 2007 resulted in relative decreases in elevation. In Water Year 2019, water levels are slightly higher than the long-term average reflecting the slightly higher than average rainfall over the past three years. Well 12-4-26G1 located in the north central part of the basin shows long-term stability although groundwater elevations decreased slightly during the most recent drought (2013-2015).

Hollister Management Area. The general pattern for the Hollister MA is exemplified in the hydrograph 12-5-23A20. Groundwater elevations were relatively low in the 1970s (before CVP) and have steadily risen to local high elevations in 2006. Water elevations have remained somewhat consistent since that time with a small decrease during the most recent drought (2013-2015). Water year 2019 elevations are average for the post recovery period. Well 13-6-19K1 shows a similar but more muted pattern of recovery. Groundwater elevations have remained fairly consistent in this year – increasing and decreasing with respective wet and dry years. The location of this well is more influenced by inflow from upgradient groundwater and less controlled by local pumping than 12-5-23A20.

Bolsa Management Area. The Bolsa MA includes artesian wells like 12-5-03B1. Groundwater elevations steadily increased from 1992 until the wet year of 1998 and have remained at a constant level since suggesting artesian conditions with groundwater levels pressurized to above ground surface. These artesian conditions are likely caused by local clay layers that create local confined conditions in the northern Bolsa and Hollister MAs.

The District Act (see **Appendix A**) requires presentation of estimates of annual overdraft for the current water year and ensuing water year. Consistent with previous Annual Reports, this would be represented by long-term groundwater level declines with accounting for rainfall conditions and CVP imports. As of 2019, groundwater elevation trends do not indicate overdraft. Recovery following the drought indicates that overdraft is not anticipated for 2020.

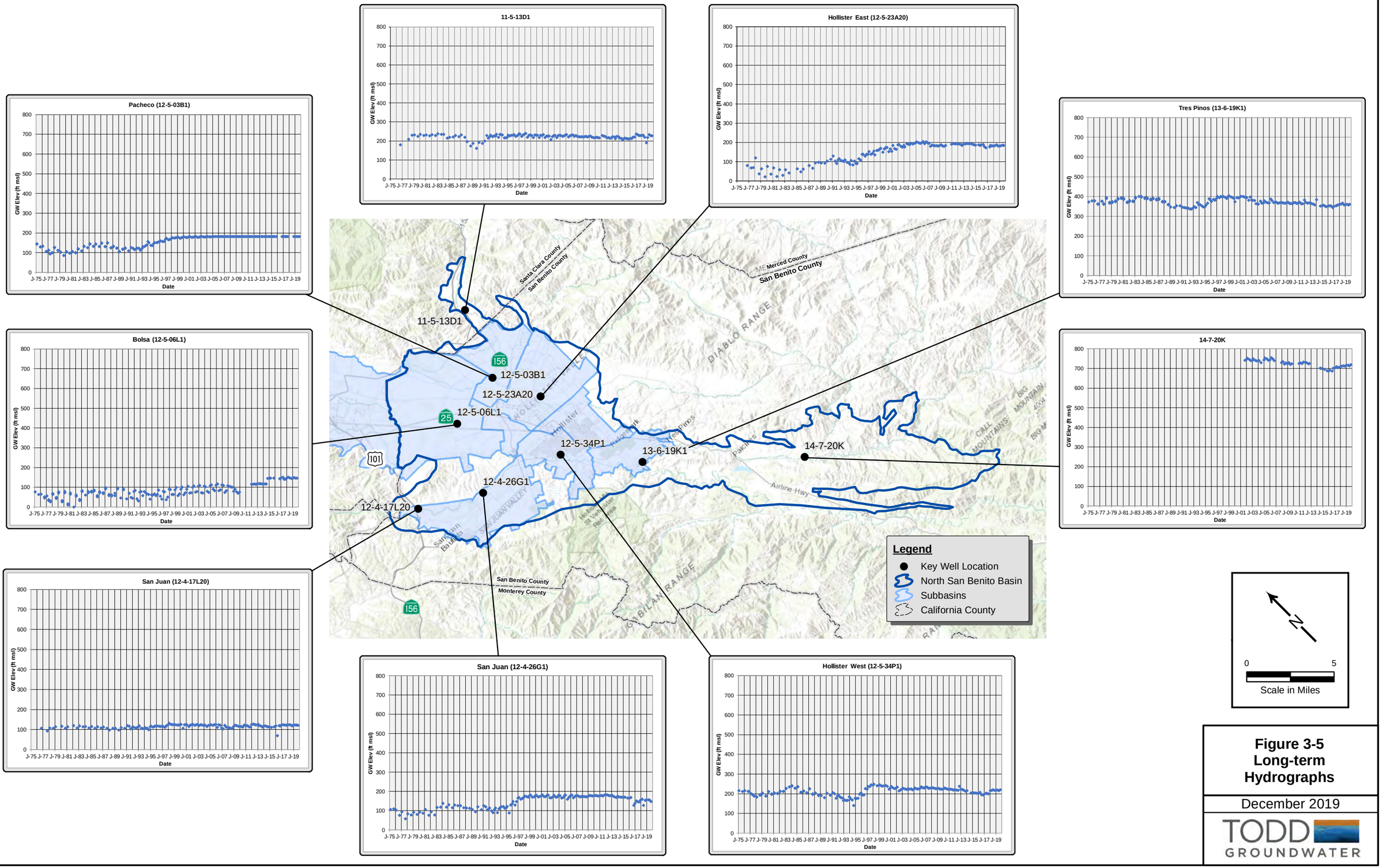

Figure 3-5
Long-term Hydrographs

December 2019

TODD GROUNDWATER

Groundwater Quality

The San Benito County Water District water quality database contains data from monitored wells, regulated facilities, and public water systems. This database was created in 2004 with a State Local Groundwater Assistance Grant and updated every three years. Water quality data for 2017-2019 were added to the database from the District, the Regional Water Quality Control Board (regulated facilities and the Ag Lands program), California State Water Resources Control Board Division of Drinking Water, City of San Juan Bautista, Tres Pinos County Water District, City of Hollister, and SSCWD. The 2019 District Water Quality Database currently contains over 520,000 records from over 1,800 monitored locations and 175 water systems or regulated facilities.

To understand how water quality has changed over time, the District has regularly monitored a distributed network of wells including the Nested Well in Hollister MA, a dedicated monitoring well that samples from five depth zones. **Figure 3-6** shows the locations of the monitored wells and Nested Well sampled by the District. As shown SBCWD has monitored 23 wells; six wells sampled by other agencies also are shown, which provide geographic coverage.

Key Constituents

An important document addressing groundwater quality has been the Salt and Nutrient Management Plan (SNMP) for Northern San Benito County, which was developed in 2014. The SNMP identified key constituents of concern (COCs) including total dissolved solids (TDS) and nitrate. These are used as indicators of overall groundwater quality in the basin. Both TDS and nitrate concentration data are available for basin inflow and outflows. Total dissolved solids and nitrate concentrations vary with depth, temporally, and spatially, and they are indicators of the overall changes in groundwater quality throughout the basin.

Total dissolved solids, a measurement of groundwater salinity, can indicate anthropogenic impacts, including the infiltration of urban runoff, agricultural return flows, and wastewater disposal. The North San Benito Basin naturally has an elevated TDS concentration in groundwater, with high concentrations reported since the 1930s. These salinity concentrations are likely due to marine sediments in the basin.

Nitrate (NO_3) is the most common form of nitrogen detected in groundwater. Natural nitrate concentrations are typically low, and elevated nitrate concentrations are often due to agricultural activities, septic systems, confined animal facilities, landscape fertilization, and wastewater treatment facility discharges. Locally elevated nitrate concentrations are recognized as a long-term concern in the basin.

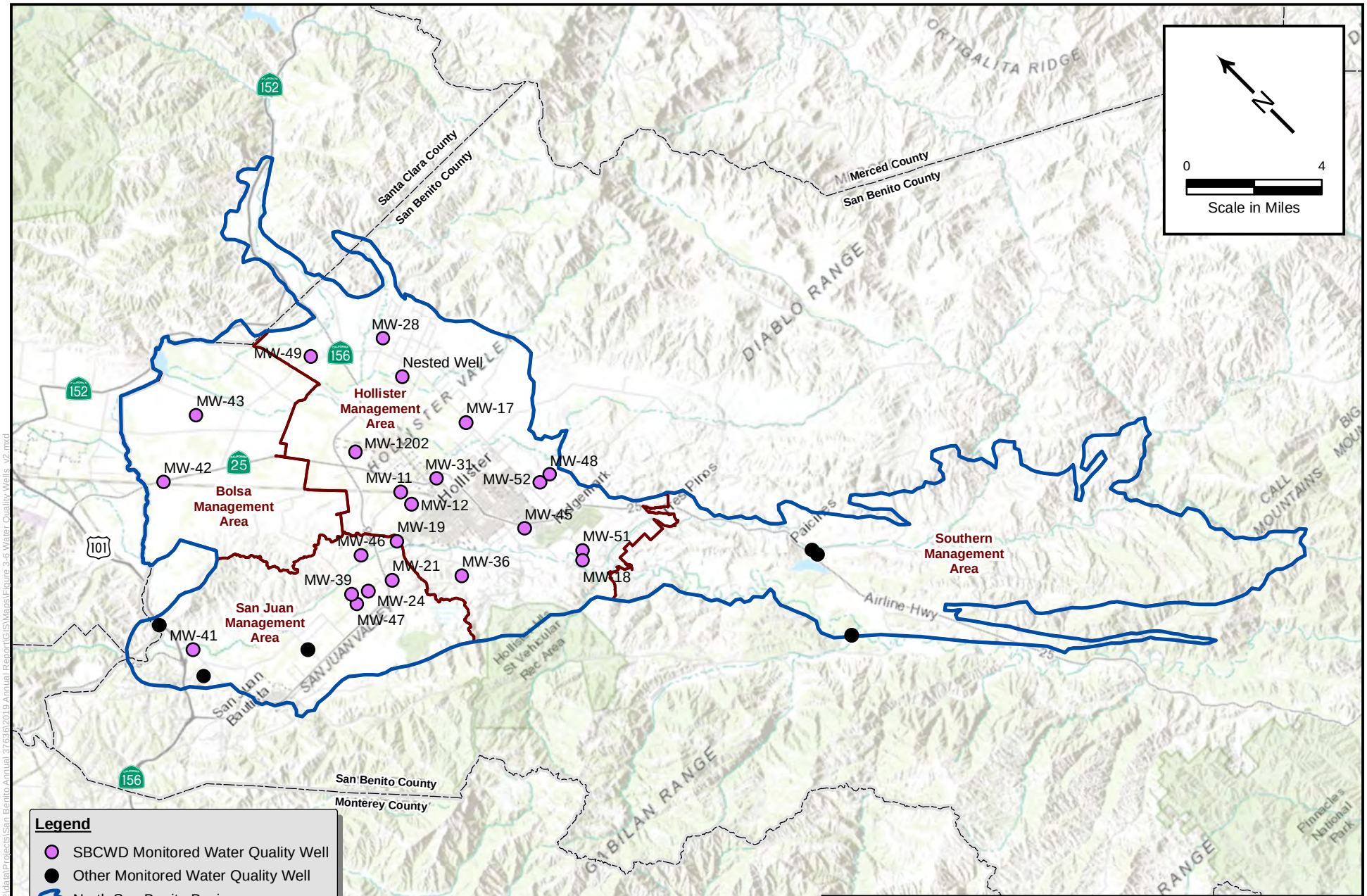

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Figure 3-6
Water Quality
Key Well Locations

Previous studies in the region have identified high concentrations of boron, chloride, hardness, metals, sulfide, and potassium and have considered these constituents of concern. Hexavalent chromium is no longer considered a constituent of concern because its maximum contaminant level (MCL) was raised in 2017, but chromium concentrations should continue to be monitored; these are further discussed in this section. High TDS concentrations are often indicative of high boron, chloride, sulfide, potassium, and hardness concentrations. High metal concentrations from anthropogenic sources are site-specific, and metals from geologic sources, like arsenic and chromium, can depend on local aquifer sediments, oxygen levels in groundwater, or groundwater pH. The water quality standards and number of samples in exceedance are listed in **Appendix C.**

Water Quality Goals

Water quality goals, or General Basin Plan Objectives (GBPOs), for TDS and nitrate concentrations were developed in the SNMP. GBPOs for the Central Coast are shown in **Table 3-2.**

Three GBPO goals exist for TDS, adopted from the Division of Drinking Water's three secondary maximum contaminant levels (SMCLs). SMCLs are concentration levels where water may develop a bad taste, color, or odor but is still safe to drink. The lower SMCL for TDS is 500 mg/L, and the upper limit of 1,000 mg/L. TDS has a short-term limit of 1,500 mg/L. High concentrations of TDS in irrigation water can be detrimental to sensitive crops or livestock health, and TDS has an agricultural GBPO of 450 mg/L.

Nitrate has a primarily MCL of 45 mg/L when expressed as nitrate (as NO3). Nitrate is also reported as nitrate (as N), with an MCL of 10 mg/L. For this report, all nitrate measurements are expressed as nitrate (as NO3). Nitrate concentrations above the MCLs can cause methemoglobinemia, or "blue baby syndrome," in humans and livestock. High nitrate concentrations may also be hazardous to pregnant women (SWRCB, 2016).

Basin-specific plan objectives were also developed in the SNMP for the Hollister area and for Tres Pinos Valley, now part of the Southern Management Area. The TDS objective for the Hollister Basin was used for the Bolsa and San Juan Subbasins because these regions have similar water quality. **Table 3-3** shows the Plan Objectives for the management areas.

Table 3-2. General Basin Plan Objectives

Parameter	Units	Municipal[1]	Ag[2]
TDS	mg/L	500/1,000/1,500	450
Nitrate (as NO3)	mg/L	45	100

1. The municipal levels specified for TDS are the "recommended" levels for constituents with secondary maximum contaminant levels
2. The Agricultural objectives for nitrate are recommended for livestock watering

Table 3-3. Basin-Specific Basin Plan Objectives

Parameter	Units	Hollister (Bolsa and San Juan)	Tres Pinos (now Southern MA)
TDS	mg/L	1,200	1,000
Nitrogen (as N)	mg/L	5	5
Nitrate (as NO_3)	mg/L	22.5	22.5

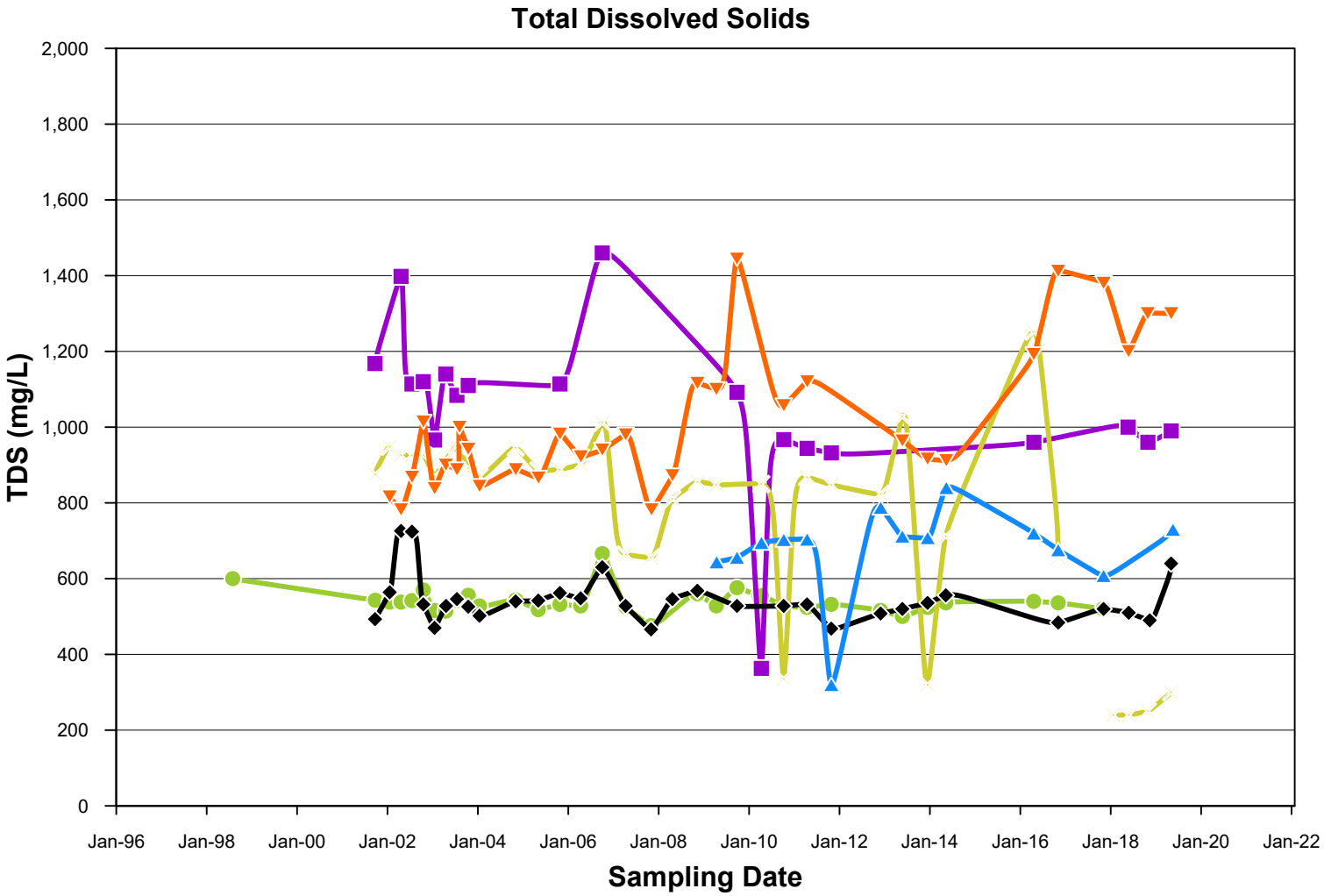
Key Constituents Results

Average constituent concentrations can provide a snapshot of groundwater quality in each management area. The average TDS and nitrate concentrations were calculated for each management area for the past three years (**Table 3-4**). The average constituent concentration is the average of all drinking water and ambient monitoring measurements from 2017-2019 for a given management area. Water quality samples from regulated facilities were excluded from the analyses as these are generally from shallow wells that do not represent the regional trend. Time concentration plots in **Figure 3-7** and **3-8** show TDS and nitrate concentrations in monitored wells over the past 17 years. The monitored wells plotted were selected to represent the general water quality of different subbasins and management areas; all water quality data collected by the District can be reviewed in **Tables C-5 and C-6** in **Appendix C**.

Table 3-4. Average Constituent Values in Management Areas

Management Area	Total Dissolved Solids mg/L	Nitrate (As NO3) mg/L
Southern	340	6
San Juan	1,417	25
Bolsa	1,280	37
Hollister	955	35

Total Dissolved Solids. As shown in Table 3-4, average TDS concentrations exceeded the 500 mg/L SMCL in every management area except for Southern MA during 2017-2019. The highest TDS concentrations occur in the northwestern portion of the Hollister MA and the eastern portion of the San Juan MA. For public supply wells and monitored wells, 50 percent of wells in San Juan and 25 percent of wells in Hollister management areas had median TDS concentrations greater than 1,000 mg/L measured from 2017-2019.



MW-17
MW-19
MW-28
MW-39
MW-43
MW-51

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Figure 3-7
TDS Time Concentration Plots

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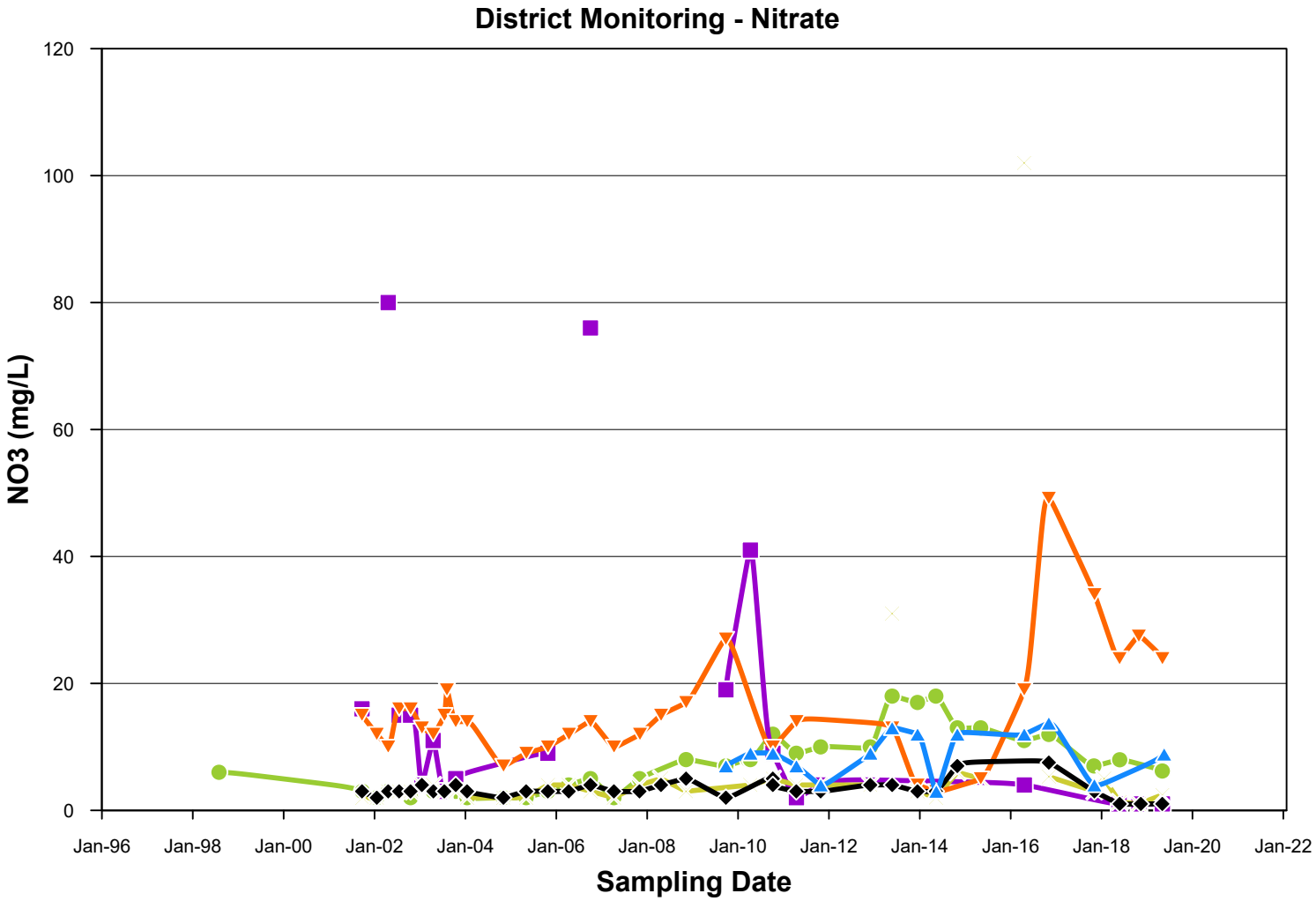

MW-17
MW-19
MW-28
MW-39
MW-43
MW-51

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Figure 3-8
NO3 Time Concentration Plots

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Figure 3-7 depicts TDS concentrations over time. In general, TDS concentrations have remained within a range 500 to 1,500 mg/L; wells with relatively good quality generally show less variability and wells with relatively poor quality show a wider range of concentrations. TDS concentrations in a well can vary for a number of reasons, including the presence nearby of a variable source, changing groundwater flow directions, and varying vertical influences as groundwater levels change and as a well is pumped (With the exception of the Nested Well, the sampled wells are active private production wells). Possible error in sampling and/or analysis contributes to apparent variability.

While **Figure 3-7** indicates general variation with a range, evaluation of trends is difficult and would likely be improved with a rigorous program including specifically sited, designed, and dedicated monitoring wells. Nonetheless, water quality problems can be detected; a case in point is provided by well MW-42 (in Bolsa). As documented in **Table C-5**, groundwater from this well historically has been characterized by low TDS concentrations (<500 mg/L) that became variably elevated after 2014 with concentrations apparently exceeding 5,000 mg/L in 2019. The District is inquiring into the situation; additional sampling is being arranged to determine if the latest measurement is a data outlier reflecting procedural problems or is indicative of a local TDS source.

Figure 3-9 shows the maximum concentrations of TDS spatially across the basin from 2017-2019. In general, TDS concentrations are below 1,000 mg/L (and within the basin objective of 1,200 mg/L) along Pacheco Creek and the San Benito River. Relatively high TDS concentrations are mainly in the central portion of the basin, some reflecting legacy municipal wastewater discharge.

Some TDS measurements were removed from the database due to believed procedural errors. The process to determine their removal is outlined in **Appendix C.**

Nitrate (as NO3). Table 3-4 shows that relatively high nitrate concentrations occur in every management area but the Southern MA. The average nitrate concentrations do not exceed the 45 mg/L drinking water standard, but average nitrate concentrations in Hollister, Bolsa, and San Juan management areas are higher than the 22.5 mg/L basin-specific plan objectives. The distribution of wells where high nitrate concentrations were measured is similar to that of TDS measurements. In all, thirteen wells had a maximum nitrate concentration greater than the 45 mg/L MCL during 2017-2019. Of these, only five had a median measurement above this drinking water limit.

Elevated nitrate in groundwater is often due to fertilizer application and wastewater disposal, so shallow wells typically have higher nitrate concentrations than deeper wells. Many of the high nitrate concentrations in the San Juan MA (MW 31, for example), are down-gradient of wastewater disposal.

Nitrate levels in monitored wells vary over time, as shown in **Figure 3-8**. Natural nitrate levels are generally below 10 mg/L, so most of these wells are deriving nitrate from anthropogenic sources. However, most wells do have nitrate concentrations below 45 mg/L. Wells with higher nitrate concentrations generally indicate greater variability, likely reflecting the same factors that affect TDS in terms of local sources and changing groundwater levels and flow directions.

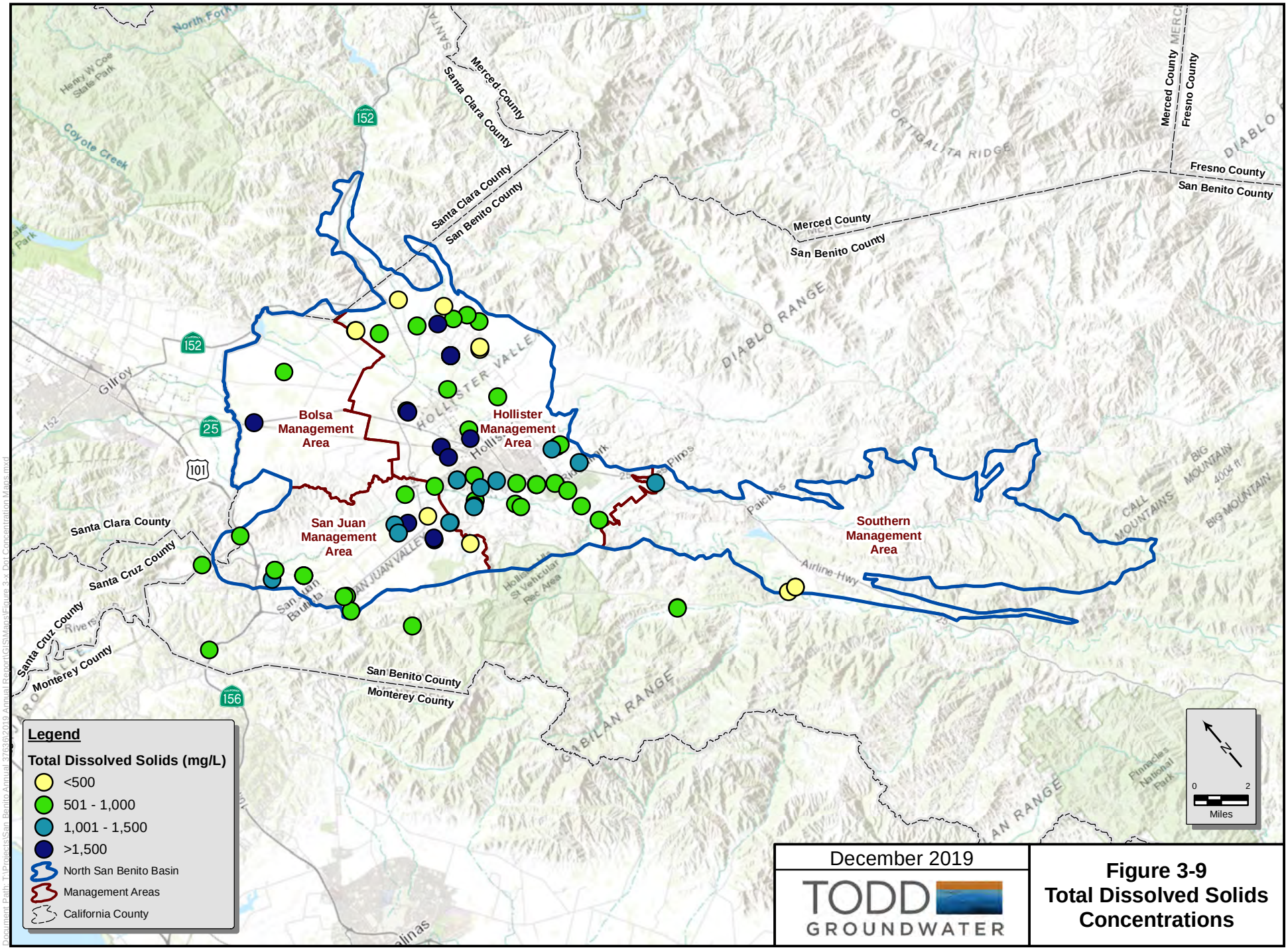

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Figure 3-9
Total Dissolved Solids Concentrations

Figure 3-10 shows the recent maximum concentrations of nitrate since 2017. Similar to TDS, wells along Pacheco Creek and the San Benito River show relatively low concentrations. However, areas with a long history of agricultural use and wastewater disposal (municipal and domestic) include hot spots of high nitrate that exceed the basin objective and MCL of 45 mg/L.

Metals in Groundwater. Hexavalent chromium (also known as CrVI or chromium VI) was considered a constituent of concern in the 2016 annual groundwater report. In 2017, the maximum contaminant level (MCL) for hexavalent chromium was increased from 10 ug/L to 20 ug/L. Because of this change, hexavalent chromium is no longer a designated constituent of concern in this basin. While chromium can originate from anthropogenic waste, much of the chromium in western California is derived from serpentinite rocks in the Coastal Range (Izbicki, 2016). Every chromium measurement from 2017-2019 for non-regulated facilities in the basin measured total chromium instead of hexavalent chromium. The MCL for total chromium is 50 ug/L, but hexavalent chromium is often the dominant form of chromium in oxygen-rich groundwater.

Ten wells in non-regulated facilities measured at least one total chromium concentration greater than 20 ug/L, and two of these wells measured total chromium levels over 50 mg/L. Groundwater from four wells in Hollister MA and one well in the San Juan MA had median total chromium concentrations over 20 mg/L. In general, groundwater with elevated chromium should be analyzed for both total chromium and hexavalent chromium. High chromium concentrations occur in the central portion of the Hollister MA, in the region with high nitrate and TDS in groundwater; a map of maximum concentrations is shown as **Figure C-5** in the Appendix.

Arsenic can enter groundwater from aquifer sediments when groundwater has low oxygen levels or a high pH. Arsenic concentrations over the 10 ug/L MCL were measured in 13 wells, most of which are in the western Hollister MA. Groundwater in this region frequently has high manganese concentrations, which suggests that it has low oxygen levels, or reducing conditions. The arsenic is likely derived from iron oxide on sediments, which dissolves in low-oxygen environments.

Vertical Variations

A Nested Well was completed in 2006 funded in part by a State Local Groundwater Assistance Act grant. Located in Hollister MA (see **Figure 3-6**), the Nested Well has ports at five different depths: A through E, in order from shallowest to deepest. Most recently, the wells were sampled in December 2018 and again in May/June 2019 (**Table 3-5**). All wells reported TDS concentrations greater than 500 mg/L and nitrate (as NO3) concentrations less than 5 mg/L.

The lowest salinity levels were reported in wells B and C, middle-depth wells. Salinity from the shallowest well, Well A, may be influenced by anthropogenic sources, like agricultural drainage. The highest salinity levels were reported in the two deepest wells. In deeper wells, high TDS levels may be from natural groundwater salinity. Throughout the basin, shallow groundwater is more vulnerable to high TDS from human activity, while deeper groundwater has high natural salinity levels.

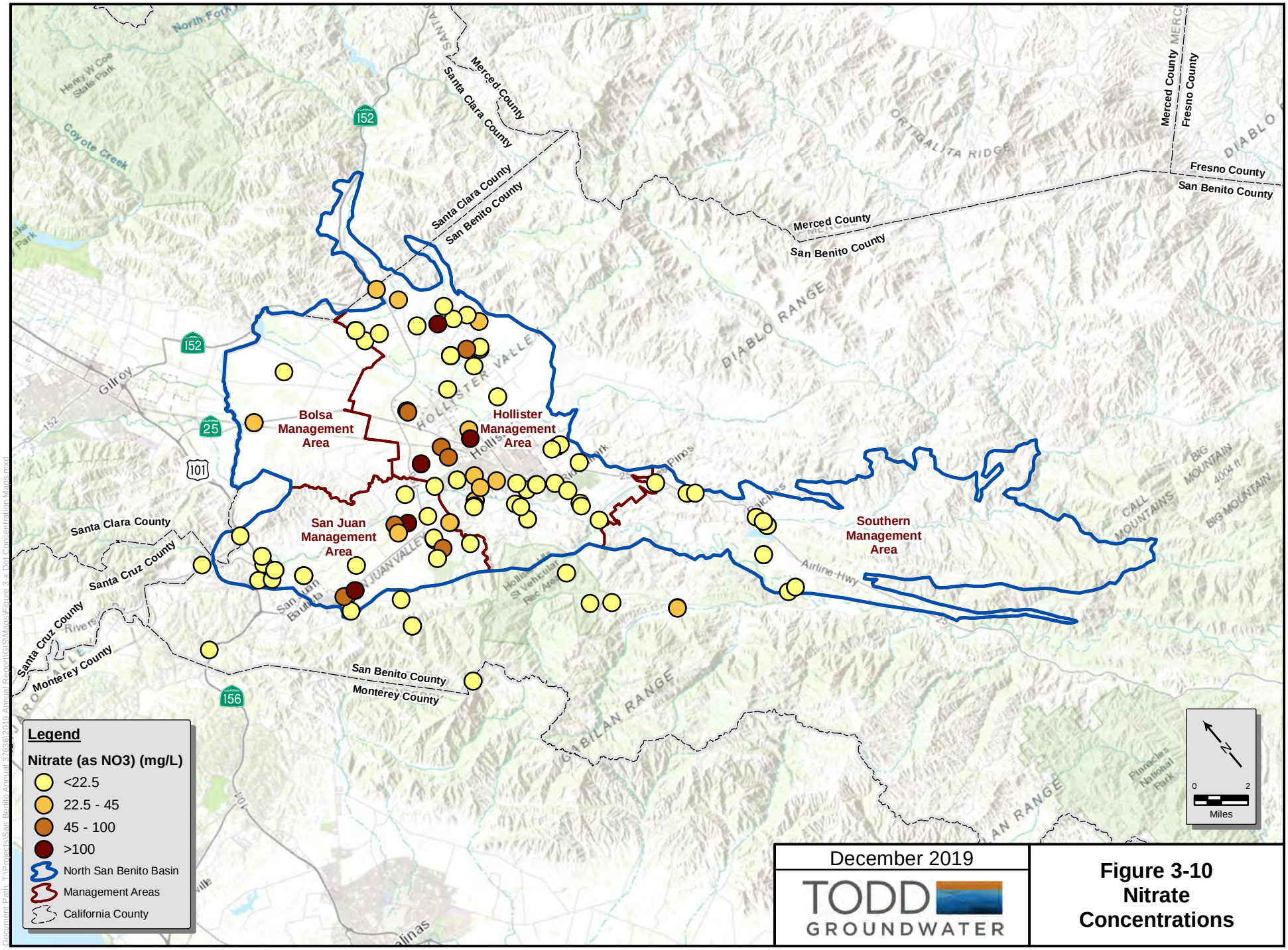


Figure 3-10
Nitrate Concentrations

Table 3-5. TDS and Nitrate Concentrations in Nested Wells

Depth	Well	COC	Dec-18	May-19	Jun-19
	A	TDS	850		920
		NO3	3.0		1.0
	B	TDS	540		540
		NO3	1.0		1.0
	C	TDS	660		630
		NO3	1.0		1.0
	D	TDS	1,300	1,200	
		NO3	1.0	1.0	
	E	TDS	2,700		1,700
		NO3	1.0		1.0

Salt and Nutrient Management Plan

The San Benito SNMP was developed in 2014 to comply with the 2013 State Water Resources Control Board Recycled Water Policy. The SNMP identifies sources of salts and nutrients currently in the basin and addresses future sources and loading. The plan outlines salt and nutrient management actions to ensure that groundwater quality is appropriate for drinking and other beneficial uses.

Analyses conducted in 2014 for the San Benito County SNMP concluded that recycled water irrigation projects satisfied the Recycled Water Policy guidelines and that recycled water use can be increased without degrading groundwater quality for beneficial uses. While the SNMP concluded that no additional implementation measures were necessary beyond existing management plans, water quality monitoring in the San Benito County Water District is ongoing. Monitoring for the SNMP is intended to determine the effectiveness of implementation measures, with a focus on basin water quality near large recycled water projects, recharge projects, and water supply wells.

Through its Annual Groundwater Reporting process and consistent with its SNMP, the District collects and compiles groundwater quality data on a semi-annual basis. These data have been analyzed and reported to the RWQCB in the District's triennial Groundwater Report and thus fulfills the SNMP-required discussion of TDS and nitrate concentrations in groundwater using the following analytical techniques:

- Time-Concentration Plots
- Evaluation of Vertical Variations in Groundwater
- Water Quality Concentration Maps
- Comparison to detections with basin-specific basin plan objectives (BSPOs)

The SNMP also requires analyses and a discussion of the status of recycled water use, stormwater capture projects, and stormwater capture implementation measures. Recycled water and stormwater are discussed in the next section.

Water quality did not change significantly during the period 2017 to 2019. This supports the conclusion in the SNMP that recycled water use would not adversely affect water quality. Nitrate and TDS concentrations have not increased in most wells in the basin. Groundwater quality monitoring will be continued, transitioning from the triennial quality update in the Annual Groundwater Reports to SGMA Annual Reporting (which focuses on groundwater quantity issues but includes progress reporting and new information) and Five-Year Updates.

Water Supply Sources

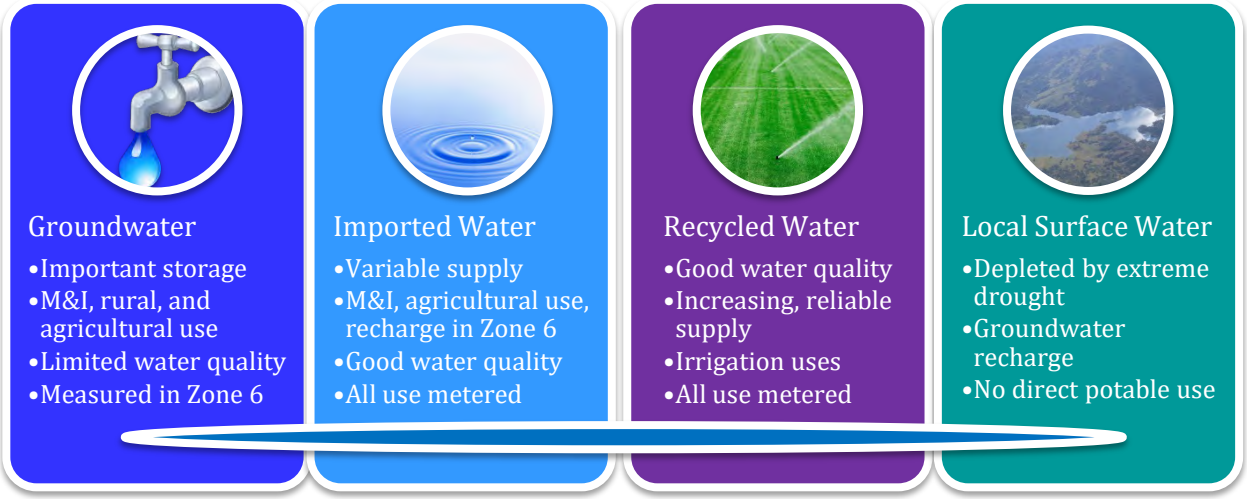
Four major sources of water supply are available for municipal, rural, and agricultural water demands in Zone 6. These are summarized below; for more data and graphs, see **Appendix E.**

Local Groundwater. Groundwater is pumped by private irrigation and domestic wells and by public water supply retailers. The District does not directly produce or sell groundwater but has the responsibility and authority to manage groundwater throughout San Benito County.

Imported Water. The District purchases Central Valley Project (CVP) water from the U.S. Bureau of Reclamation (USBR) and distributes to customers in Zone 6. Some CVP water has also been released for groundwater recharge. The District has a 40-year contract (extending to 2027 and renewable thereafter) for a maximum of 8,250 AFY of municipal and industrial (M&I) water and 35,550 AFY of agricultural water.

Recycled Water. Water recycling began in 2010 with landscape irrigation at Riverside Park. Recycled water currently is provided to selected landscape irrigation and agricultural users. This source is reliable during drought and helps secure a sustainable water supply.

Local Surface Water. Surface water is not used directly for potable or irrigation use in the basin, but creek percolation is a significant source of groundwater recharge. Releases from the District's Hernandez and Paicines reservoirs were above average in 2019, significantly contributing to recharge of the groundwater basin. Stormwater capture currently is limited to some diversion by the City of Hollister to the Hollister Industrial WWTP (via a combined sewer system) with subsequent treatment and discharge to percolation and evaporation ponds.



Available Imported Water

The District distributes CVP water to agricultural and M&I customers in Zone 6. The allocation of the contract for each year is variable and contingent on total available supply of the CVP system. In dry years, the allocation may be zero and in wet years, it may be 100 percent of the contract amount. The USBR contract years are March through February, so Water Year 2019 (Oct 2018-Sept 2019) overlapped two contract years. The above average rainfall of this current year resulted in increased allocations for the March 2019-February 2020 contract year. **Table 4-1** shows the contract entitlements and recent allocations for both USBR contract years that overlap Water Year 2019 (SLDMWA 2019).

As shown in **Table 4-1**, USBR contract year 2018 (March 2018 - February 2019) allocations were 50 percent and 75 percent for agricultural users and M&I users respectively. For USBR contract year 2019 (March 2019 - February 2020) allocations were 75 percent and 100 percent for agricultural users and M&I users respectively. Both years were above the average allocations over the past 10 years; from 2010-2019 the average allocations were 42 percent and 62 percent for agricultural users and M&I users respectively.

Table 4-1. Allocation for USBR Water Years 2018-2019

	Contract	% Allocation	Allocation Volume (AF)
Agriculture	35,550	50%	17,775
M&I	8,250	75%	6,188
TOTAL	43,800		23,963

March 2019 - February 2020

	Contract	% Allocation	Allocation Volume (AF)
Agriculture	35,550	75%	26,663
M&I	8,250	100%	8,250
TOTAL	43,800		32,723

Reported Water Use

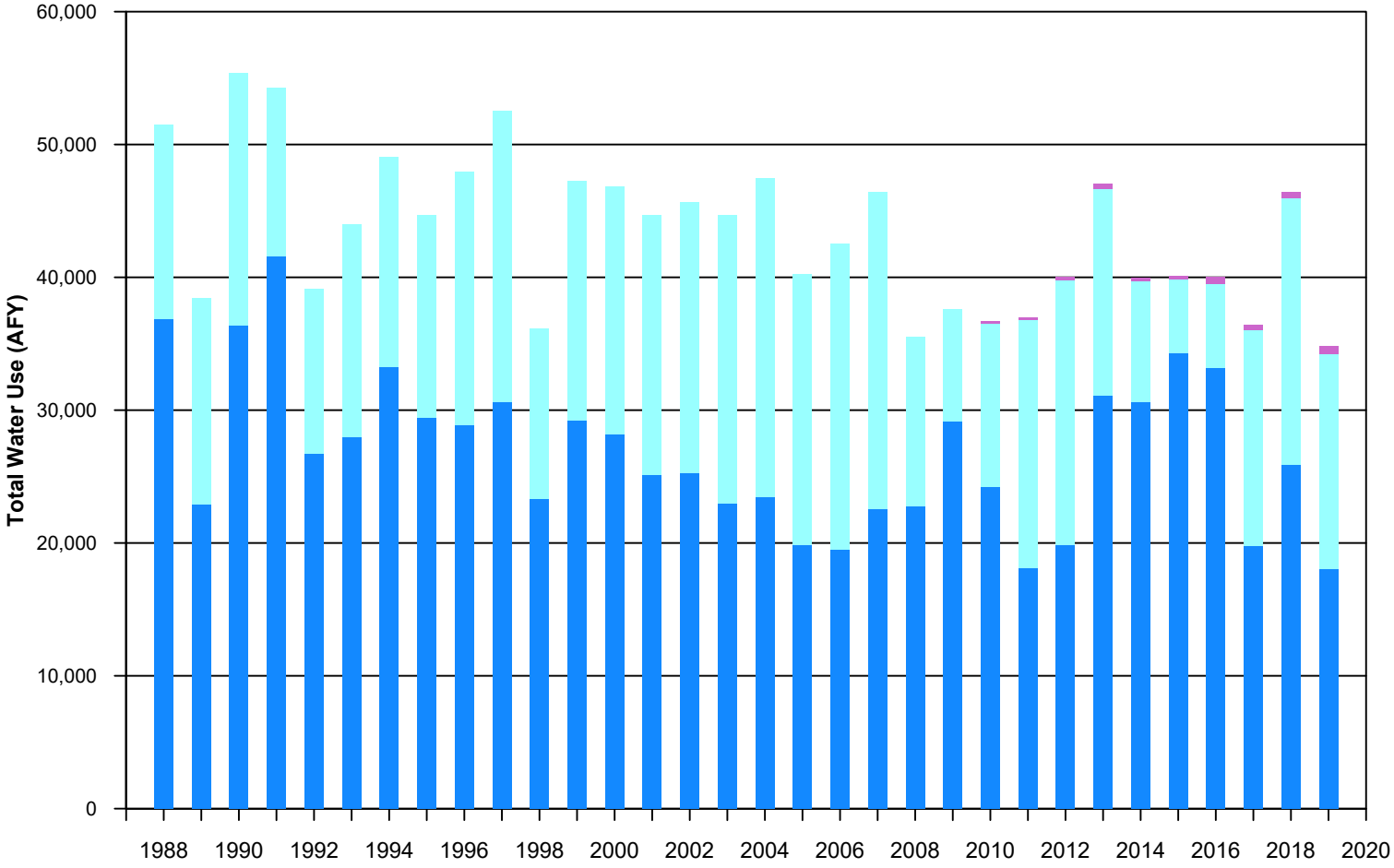
Table 4-2 shows the total reported water use in Zone 6 by source and user type for Water Years 2018 and 2019. Municipal use is metered. Agricultural CVP water use is recorded and agricultural groundwater use in Zone 6 is estimated using power meters. Independent estimates of total groundwater pumping based on crop type and irrigation rates generally indicate more groundwater use than is reported by the meters. At this time, the Annual Groundwater Report continues to use the reported water use to allow for consistency of analysis from year to year. Actual groundwater pumping in North San Benito Groundwater Basin is considered a data gap and the GSP will identify potential methods to improve assessment of pumping in Zone 6 and throughout the basin.

In Water Year 2019, total water use decreased 25 percent from 2018, returning to volumes similar to 2017. Reported water use decreased for agricultural and M&I customers using CVP and/or groundwater. However, recycled water use increased 21 percent reflecting the District's plan to continue to increase recycled water delivery. **Figure 4-1** shows Zone 6 reported water use by source since 1988. Overall, the graph indicates that water use has a general declining trend since 2013, except for the significant increase in 2018 (attributable in part to increased M&I use of CVP and increased groundwater pumping for agriculture; see 2018 Annual Report). Water conservation that began during the 2013-2015 drought continues to moderate water use in the basin. The graph also shows the general balance between CVP and groundwater use; groundwater represented a large portion of the supply during the drought and following year when CVP water was curtailed. In Water Year 2019, groundwater was 52 percent of the total reported water use, CVP represented 46 percent of supply, and recycled water was 2 percent.

Figure 4-2 illustrates the use of groundwater and CVP supply in Zone 6 from 1988 to 2019. The top graph shows groundwater reported use in Zone 6, including the increase of groundwater use during the most recent drought and following year (i.e., 2013-2016) when CVP allocations were reduced and a marked decrease in the past three years when CVP allocations were restored. Groundwater use for M&I has decreased as the treatment plant capacity for Hollister and SSCWD has allowed more CVP water to be delivered to M&I customers in the Hollister Urban Area. The bottom graph shows CVP use in Zone 6. Corresponding to the decreased groundwater use, CVP for M&I has increased steadily from 1996 through 2019. In addition, the District has resumed percolation of CVP water in recent years. The graph illustrates the variability of CVP supply due to drought/wet year cycles and other restrictions, notably the decrease after the 2007 Federal Court decision on Delta smelt. In brief, when CVP supply has been reduced, groundwater supply has been available, representing conjunctive management.

Table 4-2. Total Water Use in Zone 6 by User and Water Source 2018-2019

	CVP		Groundwater		Recycled Water		Total	
	2018	2019	2018	2019	2018	2019	2018	2019
Agriculture	14,453	11,731	21,108	15,423	364	461	35,925	27,616
M&I	5,679	4,457	4,748	2,660	107	108	10,533	7,225
TOTAL	**20,131**	**16,188**	**25,856**	**18,083**	**471**	**569**	**46,458**	**34,841**



Recycled Water
CVP
Groundwater

December 2019

TODD GROUNDWATER

Figure 4-1
Zone 6 Water Use by Source 1988-2019 (AFY)

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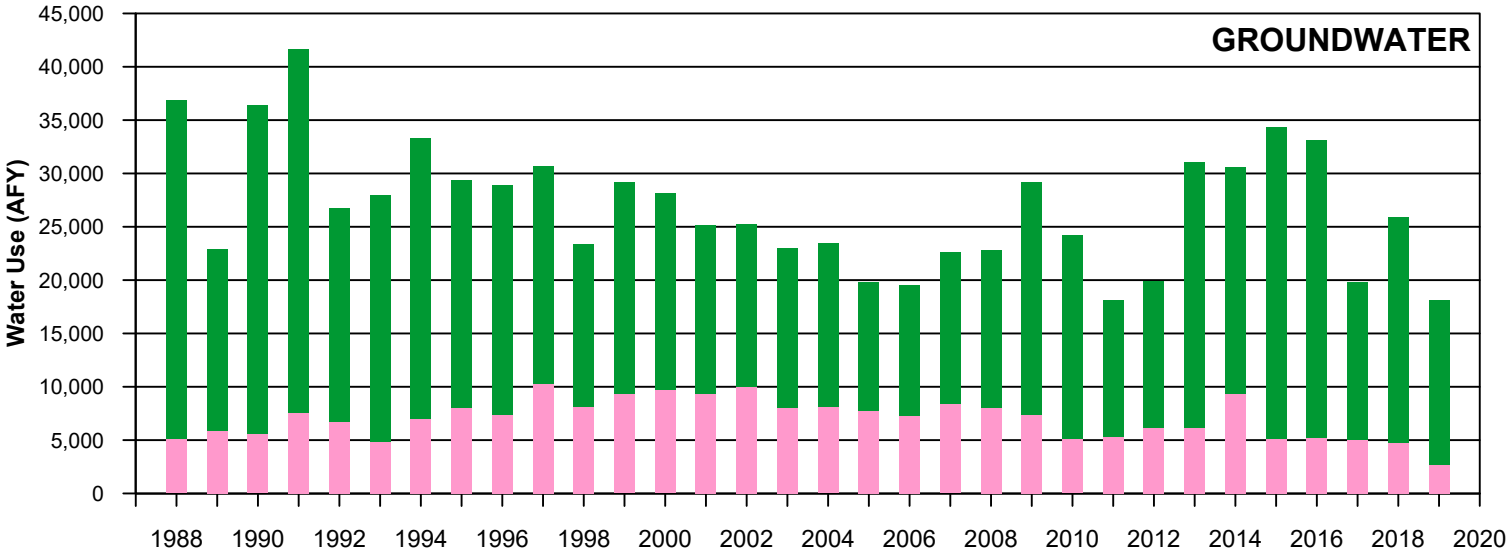

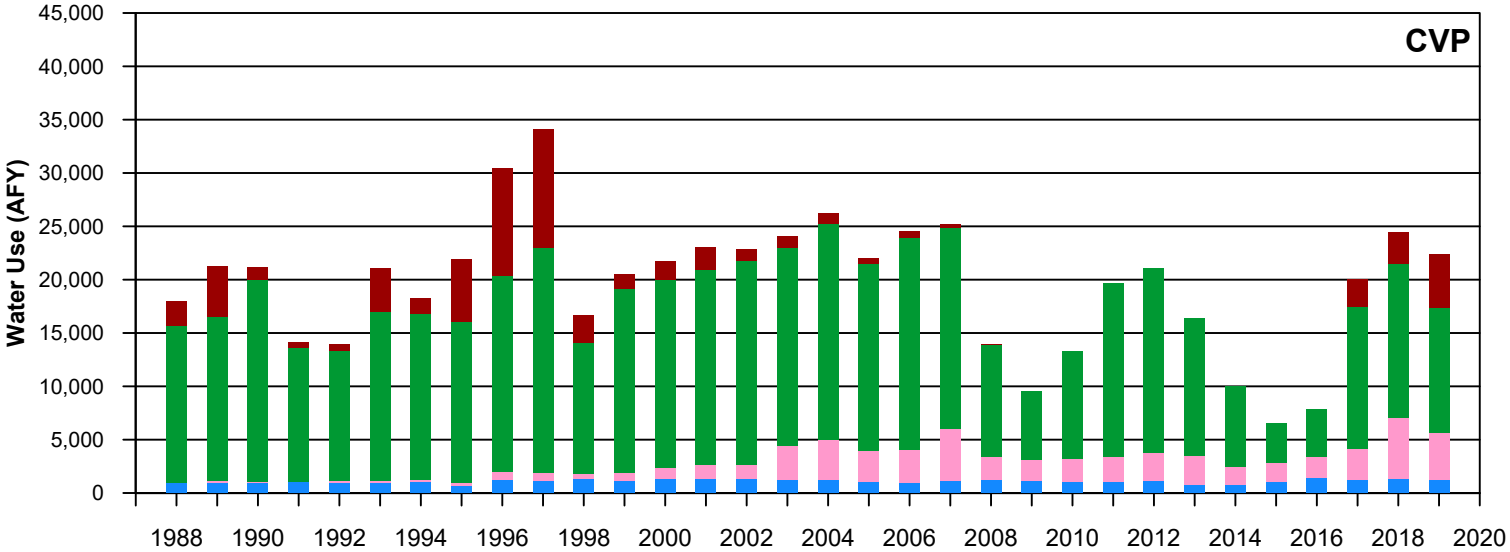

Percolation
Agricultural
Domestic & Municipal
Seepage & Evaporation

December 2019

TODD GROUNDWATER

Figure 4-2
Groundwater and CVP Supply in Zone 6

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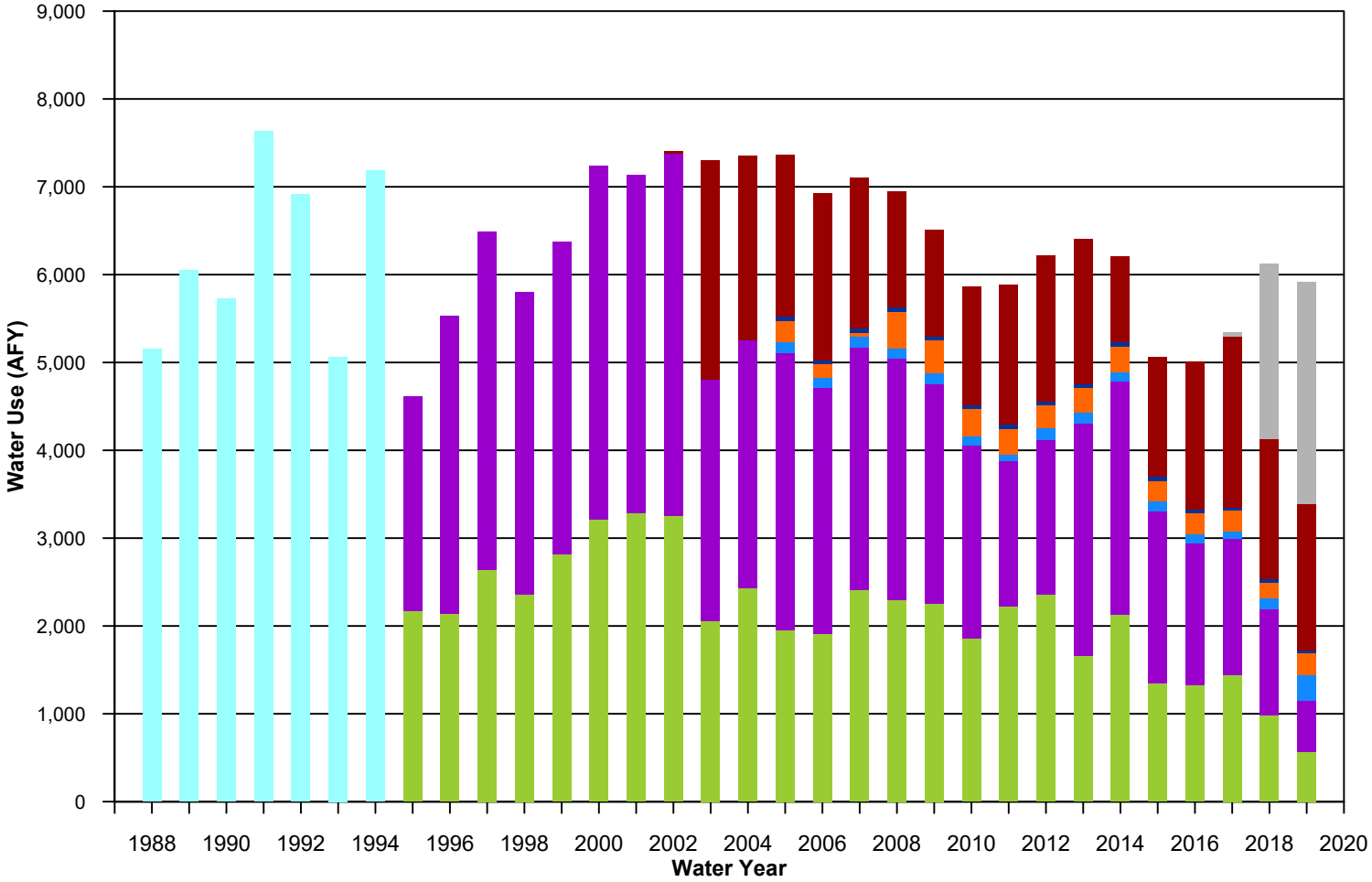
Table 4-3 shows the breakdown of total water use by each subbasin (and management area) in Zone 6. Consistent with past patterns, San Juan is the largest producer of groundwater and the second largest user of CVP supplies, mainly for agricultural irrigation. Hollister East is the largest user of CVP for both agricultural users and municipal uses, reflecting extensive agriculture and the expanded municipal water treatment capacity.

Table 4-3. Zone 6 Water Use by User and Water Source 2018-2019

Management Area	Subbasin	CVP Water		Groundwater		Recycled Water	
		Agriculture	Domestic & Municipal[1]	Agriculture	Domestic & Municipal	Agriculture	Domestic & Municipal
Hollister	Bolsa South East	318	0	2,568	0	2	0
	Hollister East	5,076	4,184	2,597	205	0	0
	Hollister West	252	21	1,095	998	459	108
	Tres Pinos	96	88	180	1,013	0	0
	Pacheco	2,121	41	2,717	63	0	0
San Juan	San Juan	3,867	123	6,266	381	0	0
TOTAL		11,731	4,457	15,423	2,660	461	108

1. Hollister East includes 2,524 AF of CVP water delivered to the West Hills Treatment Plant in San Juan but supplied to Hollister East customers.

Figure 4-3 shows the municipal water supply for the City of Hollister, SSCWD, San Juan Bautista, and Tres Pinos County Water District. Prior to 2003, the municipal demand was satisfied entirely by groundwater. The completion of Lessalt Water Treatment Plant (WTP) in 2003, the expansion of Lessalt in 2016, and the completion of West Hills WTP in 2018 have significantly increased the use of CVP water for the Hollister and SSCWD municipal systems. In **Figure 4-3**, annual water supply provided through the Lessalt WTP is shown in maroon and West Hills WTP in grey. In 2019, these two treatment plants served over 70 percent of the M&I supply. This ability to maximize CVP use will increase flexibility for local water users to use groundwater or CVP. It also provides better quality water for delivery to municipal customers and result in improved wastewater quality, which supports water recycling.



San Juan Bautista Wells
City of Hollister - Cienega Wells
City of Hollister - GW Wells
Sunnyslope CWD Wells
Tres Pinos CWD Well
Lessalt Water Treatment Plant
West Hills Water Treatment Plant
Undivided Total

December 2019

TODD GROUNDWATER

Figure 4-3
Municipal Supply by Source

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Difference Between Meters and Model

As noted above, this section addresses Zone 6, where CVP water use for agriculture is measured through the blue valves and groundwater use for agriculture is evaluated through hour meters that measure power use. Municipal use of CVP water is measured; the major municipal providers (Hollister, San Juan Bautista, SSCWD) also measure groundwater production through meters. Groundwater use beyond Zone 6 for agricultural, domestic, and community water supplies generally is not metered.

For comprehensive evaluation of groundwater pumping across the basin (including Zone 6 and beyond), an alternative methodology has been used for development of the basin-wide numerical model and water balance for the GSP. The methodology evaluates groundwater pumping using land use maps and information on the consumptive use of crops and other factors such as rainfall, runoff, and evapotranspiration. This analytical estimate, calculated independently from the hour meters, indicates that groundwater use in the basin is greater than the use observed from hour meters and reported in annual reports. SGMA requires annual reporting of all groundwater extractions (except de minimis pumpers using less than two AFY) using best available measurement methods. Accordingly, the District has identified groundwater pumping amounts as a data gap and as part of the GSP is identifying alternative methods to accurately measure the annual volume of groundwater pumping.

5-WATER MANAGEMENT ACTIVITIES

District water management activities include comprehensive monitoring (summarized in Section 2) and importation and distribution of CVP water in Zone 6 (Section 4). In addition, the District provides water resources planning, water conservation support services, and managed percolation of local surface water to augment groundwater; these are summarized in this section. Sources of revenue to support District operations also are presented here.

Water Resources Planning

The District has used multiple planning efforts to support groundwater sustainability. These have included water management plans such as the Groundwater Management Plan (1998 and 2003), Integrated Regional Water Management Plan (2007) and subsequent updates, Salt and Nutrient Management Plan (2014), Agricultural Water Management Plan (2015), and Urban Water Management Plans (2016). These plans have addressed a range of groundwater sustainability issues with advancement of conjunctive use of imported water, local surface water, recycled water and groundwater; with water conservation, and with protection of water quality. Current efforts and recent accomplishments are summarized below.

Hollister Urban Area Water Project. This project is an ongoing collaborative effort with local agencies to provide a secure and stable water supply to the region. The project has involved provision of water treatment for CVP water, which allows its direct use for municipal and industrial (M&I) purposes. It also allows delivery of improved quality water to customers. 2019 continues to see the beneficial effects of the new West Hills WTP and newly expanded Lessalt WTP. The District also has worked cooperatively for years with the City of Hollister to implement recycled water use primarily for agricultural irrigation, which is expected to increase in coming years.

Pacheco Reservoir Expansion Project. The District has been collaborating with Santa Clara County Water District and Pacheco Pass Water District on planning and studies related to the Pacheco Reservoir Expansion Project. The reservoir would allow storage of CVP supplies and local flows from the Pacheco Creek watershed. The District is contributing modeling services to evaluate potential impacts on stream flow, steelhead trout migration, and groundwater recharge along Pacheco Creek downstream of the dam. These studies are being conducted concurrently with the GSP, which will address related issues of surface water-groundwater interactions along Pacheco Creek. The analysis is addressing the 1922-2003 period, consistent with CVP operations modeling. This work is in progress and expected to continue into 2020.

North County Project. In collaboration with the City of Hollister and Sunnyslope County Water District, the District is proceeding with Phase I of the North County Project. The goal of this phase is to install a new municipal well near the northern part of Hollister. A key objective is to obtain groundwater of relatively high quality (low hardness, TDS and nitrate); the effort will commence with a survey of existing groundwater quality to support selection of two sites for test wells. The work will commence in 2020.

Water Conservation

Water conservation is an important tool to manage demands on the groundwater basin particularly during drought. Water conservation efforts in San Benito County are conducted through the Water Resources Association (WRA). WRA is a cooperative effort among the District, City of Hollister, City of San Juan Bautista, and Sunnyslope County Water District.

The WRA worked tirelessly during the recent drought (2013-2015 plus 2016 with reduced CVP) to decrease water use and many of these initiatives continue to show results. Water demand for the large municipal retailers has remained lower than 2013 volumes. For example, SSCWD average monthly water use in 2019 was 17.3 percent lower than respective water use in 2013.

Water Conservation continues throughout the basin with activities including provision of information, home surveys, and rebates. To keep the public informed, the WRA has prepared bill inserts that highlight water conservation programs and provide updates on water conditions. The WRA takes an active role in SGMA public workshops educating the public on changes in groundwater management.

In 2019, WRA provided presentations to 28 schools (reaching over 850 students last year) and to local organizations such as the Chamber of Commerce, Association of Realtors, and Rotary Club. WRA also has staffed a booth at the County Fair and at the League of United Latin American Citizens (LULAC) Health Fair, with posters and handouts providing information on local water resources. In addition, print and online articles promoting water conservation have been published in the Free Lance newspaper and Benito Link. The Home Water Survey allows the WRA to directly work with customers who have a leak or large water bill. The WRA has been able to reach approximately 250 people a year with this service.

WRA also provides various rebates (toilets, landscape hardware, etc.) The most popular rebate program is the water softener demolishing/replacement program. With provision of CVP supply for municipal use, the delivered water quality has improved, and customers are willing to abandon unneeded water softeners. This program has the benefit of improving the water quality of municipal wastewater and recycled water.

Managed Percolation

Percolation of Local Surface Water. In most years, local surface water released from Hernandez and Paicines reservoirs is percolated along the San Benito River and Tres Pinos Creek. Releases are managed to maximize percolation along the stream channels of the San Benito River and Tres Pinos Creek and to avoid any losses out of the basin. Hernandez Reservoir releases in 2019 were above average (reflecting the above normal rainfall), amounting to 15,924 AF. Releases from Paicines were 2,045 AF, also above average.

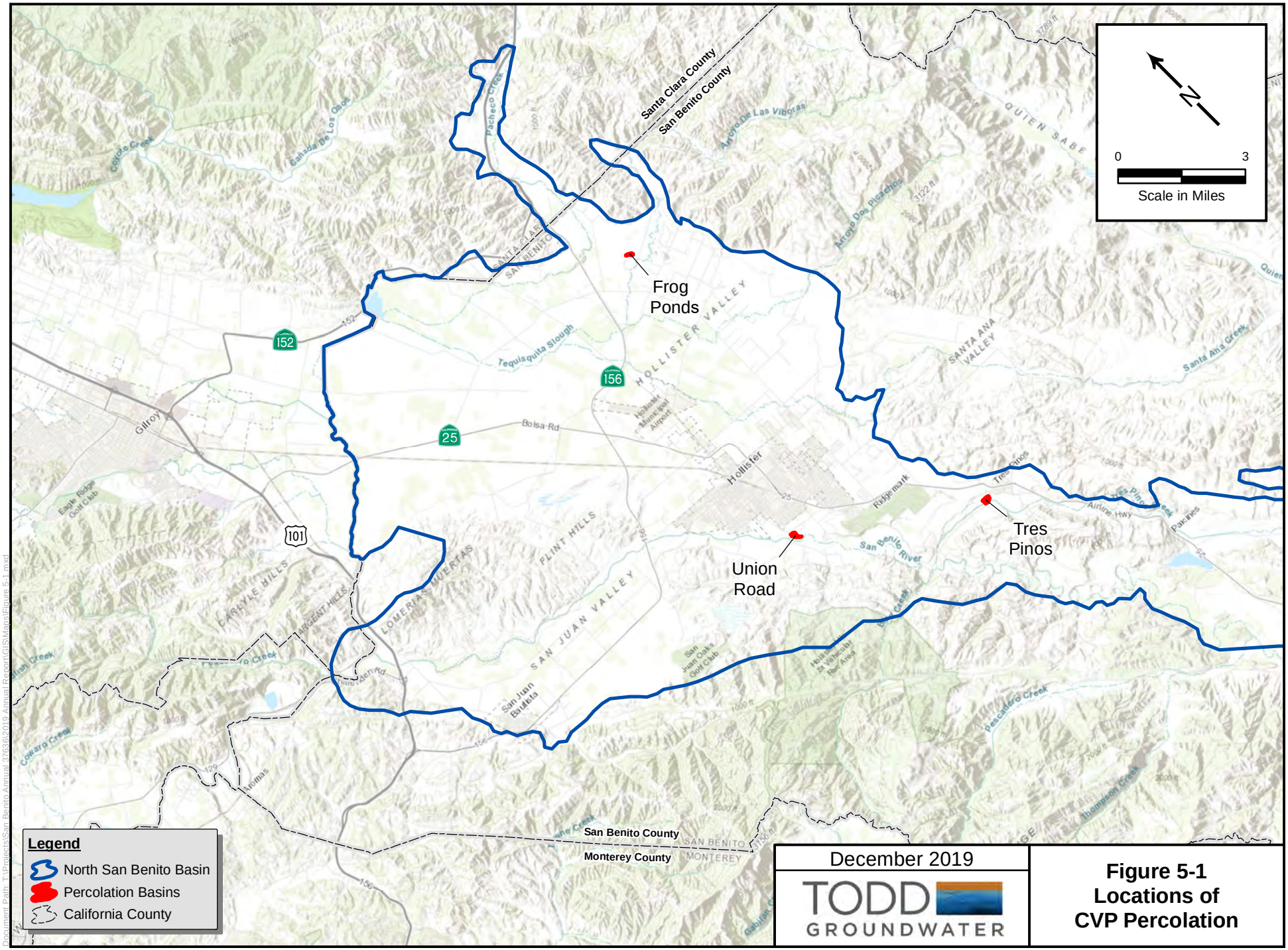
Percolation of Wastewater. Wastewater is percolated by the City of Hollister at its Domestic and Industrial plants, by SSCWD at its Ridgemark Facilities, and by Tres Pinos County Water District. Recent changes in operation of the wastewater facilities (including increased water recycling) and decreased municipal water use have decreased the volume percolating to the groundwater. Information about the amount of groundwater recharged from these wastewater facilities is found in **Appendix D**.

Percolation of CVP Water. In Water Year 2019, the District percolated 5,043 AF of CVP water in three dedicated off-stream basins; locations are shown in **Figure 5-1. Figure 5-2** shows the volume of CVP recharge by major water way over time. The managed recharge of the imported water was critical in replenishing the basin in the 1980s and 1990s; however, the threat of zebra mussel contamination and low CVP allocations prevented the practice from 2008 to 2016. The District has resumed recharge at dedicated basins adjacent to streams.

Financial Information

The District derives its operating revenue from charges levied on landowners and water users. Non-operating revenue is generated from property taxes, interest, standby and availability charges, and grants. District zones of benefit are listed in Appendix A. Zone 6 charges, relating to the importation and distribution of CVP water, are the focus of this section.

Table 5-1 presents the groundwater charges for Zone 6 water users, which reflect costs associated with monitoring and management. A full worksheet of how groundwater charges are determined can be found in **Appendix F**. Groundwater charges are adjusted annually in March. For March 2019 – February 2020, District rates are $12.75 for agricultural use and $38.25 for M&I use. The District adopts rates on a three-year cycle. Current water rates were adopted January 30, 2019.



December 2019

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Figure 5-1
Locations of CVP Percolation

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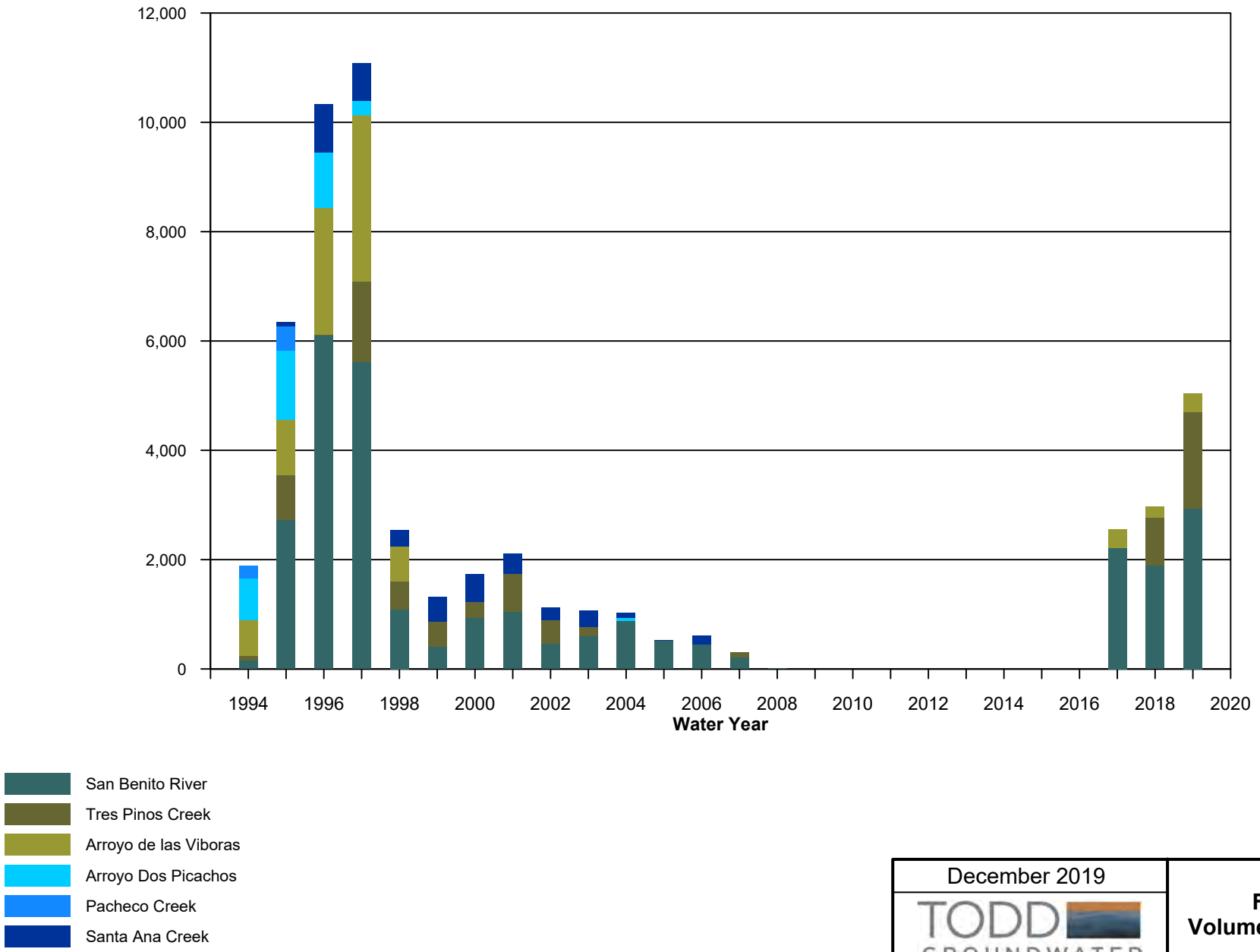

December 2019

TODD GROUNDWATER

Figure 5-2
Volume of Percolation

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Table 5-1. Adopted Groundwater Charges

Year	Agriculture ($/AF)	M&I ($/AF)
2019-2020	$12.75	$38.25
2020-2021	$13.15	$39.40

CVP rates (provided by the USBR) include the cost of service, restoration fund payment, charges for maintenance of San Luis Delta Mendota Water Authority facilities, and other fees (the breakdown is found in **Appendix F**). The District's blue valve rates (paid by users of CVP water) include a water charge and a power charge. Additionally, the standby and availability charge is a $6 per-acre charge assessed on all parcels with access to CVP water (an active or idle turnout from the distribution system). **Table 5-2** shows the CVP water charge and **Table 5-3** shows the CVP power charge.

Table 5-2. Adopted Blue Valve Water Charges

	Blue Valve Water Charge ($/AF)			
		Agricultural		
Year	Non - Full Cost	Full Cost (1a)	Full Cost (1b)	Municipal & Industrial
2019-2020	$254.00	$386.00	$407.00	$404.00
2020-2021	$265.00	$400.00	$421.00	$415.00

Table 5-3. Adopted Blue Valve Power Charges

Blue Valve Power Charge ($/AF)	Subsystem 2	Subsystem 6H	Subsystem 9L	Subsystem 9H	All other subsystems
2019-2020	$80.45	$39.30	$88.15	$130.30	$33.70
2020-2021	$82.85	$40.45	$90.80	$134.20	$34.75

Recycled water charges (**Table 5-4**) are set to recover current operating and maintenance costs related to the water service. Recycled water rates include those associated with water supply, water quality, and infrastructure.

Table 5-4. Adopted Recycled Water Charges

	Recycled Water ($/AF)	
Effective	Agriculture Rate	Power Charge
Mar-18	$183.45	$59.45
Mar-19	$183.45	$59.45

6-GROUNDWATER SUSTAINABILITY

Sustainable Groundwater Management Act (SGMA)

The Sustainable Groundwater Management Act (SGMA) requires sustainable management of priority groundwater basins and empowers local Groundwater Sustainability Agencies (GSAs) to manage groundwater resources. San Benito County Water District GSA (SBCWD GSA), in partnership with Santa Clara Valley Water District GSA (SCVWD GSA) for small portions of the basin in Santa Clara County, is developing a Groundwater Sustainability Plan (GSP) for the North San Benito Basin, which encompasses the historically-defined Bolsa, Hollister, and San Juan Bautista Subbasins of the Gilroy-Hollister Basin and the Tres Pinos Valley Basin. This GSP is being funded in part with a $830,000 grant from the California Department of Water Resources (DWR) and with GSA cost sharing. **Figure 1-1** shows the GSP area, which is mostly in San Benito County with small portions extending into Santa Clara County.

Groundwater Sustainability Plan Development

The District began GSP development in 2018 and several draft plan sections are already available to the public through the District's website SBCWD website: https://www.sbcwd.com/sustainable-groundwater-management/. These draft sections of the initial GSP include the following.

Plan Area/Institutional Setting. The first two sections of the GSP, Introduction and Plan Area, describe the North San Benito Basin and the institutional setting. The *Introduction* presents the North San Benito Basin and the authority of the GSAs to prepare a GSP. The *Plan Area* section provides basic information on the North San Benito Basin including its physical boundaries, jurisdictions of water and land use planning agencies, water sources and water use sectors, existing monitoring and management, land use planning, and well permitting. The public draft of these sections is available on the District's website.

Hydrogeologic Conceptual Model/Groundwater Conditions. The hydrogeologic conceptual model is a description of the structural and physical characteristics that govern groundwater occurrence, flow, storage, and quality. These characteristics—described in text, tables, maps, and cross-sections—include regional geology, soils, geologic structures (such as faults) and boundaries (including bottom of the basin), and aquifer properties. The Groundwater Conditions section documents historical and current groundwater conditions including groundwater levels and flow, groundwater quality, land subsidence, and interactions of groundwater and surface water. In brief, these sections describe how the local surface water-groundwater system works. The public draft is available on the District's website.

Water Budgets. Currently in preparation, the water budget section quantifies the surface water and groundwater inflows, outflows, and change in storage. Water budgets are provided for historical and current conditions and simulated into the future using the newly updated and expanded numerical model of the basin. Water balances developed by SCVWD for the adjacent Llagas Basin were reviewed

to promote a consistent approach. The GSP Water Budget Section discusses sustainable yield and considers potential overdraft. This section also includes the definition of *management areas*, involving subdivision of the North San Benito Basin to facilitate sustainable groundwater management. The public draft of this section will be available on the District's website soon.

Technical Advisory Committee (TAC)

Development of an effective and credible GSP is a multi-disciplinary process that combines engineering, science, and planning with local stakeholder interests and community values. To help guide this process, a Technical Advisory Committee (TAC) was organized in 2018. The TAC has held six quarterly public meetings to incorporate community and stakeholder interests into the GSP process. The TAC members are responsible for reviewing draft products and materials and providing input to support a technically sound GSP. Members of the TAC have been selected to represent GSP-related subject areas, including but not limited to environmental, technical, and land use planning fields. The TAC members will continue their quarterly meetings working collaboratively with SBCWD GSA staff and consultants throughout the GSP process. Information is provided at https://www.sbcwd.com/community-involvement/.

Community Engagement

The GSP process seeks to engage the diverse public, stakeholders, and groundwater interests. The first two public workshops were held in Water Year 2019. These workshops focused on:

Introduction to SGMA and GSPs – The November 2018 workshop detailed what is required through SGMA and described the District's approach to management. In addition, the first two sections of the GSP (Introduction and Plan Area) were presented. The meeting was well attended and provided a forum for the community to engage and ask questions of the District staff and consultants.

Hydrogeological Conceptual Model (HCM) and Groundwater Conditions (GW) – The May 2019 workshop presented the preliminary findings of the HCM and GW. The formal presentation was followed by an informal poster session where District staff and consultants were available to discuss specific findings with the public.

Additional workshops will be scheduled in 2020 to discuss the water budget, sustainability criteria, and possible management actions. Announcements are provided on the website above.

GSP Next Steps

Additional portions of the GSP are currently being discussed and developed, including:

Sustainability Criteria. While SBCWD has a long history of groundwater management, such management has not included systematic quantification of undesirable results, minimum thresholds, or measurable objectives to the extent required by SGMA. The GSP process will address the five undesirable results/sustainability indicators relevant to North San Benito Basin and indicated by the icons below. These include: chronic lowering of groundwater levels, groundwater storage depletion, water quality degradation, land subsidence, and depletion of interconnected surface water. Each of these will be defined in terms of minimum thresholds where occurrence of an undesirable result becomes significant and unreasonable and in terms of measurable management objectives.

Management Actions/Monitoring. The GSP will present management actions—policies, programs, and projects—that will address the sustainability criteria and provide for sustainable management into the future. This GSP also will establish the GSP monitoring network and protocols that: 1) provide data to inform the hydrogeologic conceptual model, water budget and numerical model, 2) provide tracking and early warning regarding groundwater conditions and undesirable results, and 3) demonstrate progress toward and achievement of sustainability.

Data Compilation/Data Management System. SBCWD has an annual program of collecting and compiling groundwater data into a data management system (DMS) that includes groundwater elevation, water quality, and water use data for the Annual Groundwater Reports. The GSP will review and update the DMS, identify data gaps, and support the GSP monitoring program. Available information will support the entire GSP including analysis of the hydrologic setting, groundwater conditions, sustainability criteria, and potential projects and management actions. This process will be ongoing throughout the initial GSP, annual reports, and GSP updates.

Annual Reporting. Once the GSP is completed (before January 31, 2022) the SGMA process will continue through annual reporting and through five-year updates. SBCWD has been preparing Annual Groundwater Reports for many decades consistent with the District Act (see **Appendix A**) and it is anticipated that future Annual Reports will be responsive to both SGMA and the District Act. SGMA Annual Reports have specific requirements that include documentation of groundwater levels and storage change and reporting of basin-wide groundwater extraction. Five-year updates are intended mostly to identify new information, to address newly-identified data gaps (and what to do about them), to discuss changed conditions, to consider if changes are needed for any aspect of the GSP (including sustainability criteria), to describe recent management actions and GSP amendments (if any), and to summarize current coordination among local agencies; in other words, to provide an update on how sustainable management is proceeding.

7-RECOMMENDATIONS

District policies and programs have served to effectively manage water resources for many years. The District, working collaboratively with other agencies, has eliminated historical overdraft through importation of CVP water, has developed and managed multiple sources of supply to address drought, has established an active and effective water conservation program, has initiated programs to protect water quality, and has improved delivered water quality to many municipal customers. The District also has provided consistent reporting and outreach. The following recommendations are responsive to the District Act and look forward to continuing effective management consistent with SGMA.

Monitoring Programs

The monitoring programs will be expanded to the entire North San Benito Groundwater Basin and improved to ensure accurate and consistent data for GSP development and the Annual Reports. A network of dedicated monitoring wells would support documentation in the Annual Reports and GSP of groundwater levels and quality. Accurate measurement of groundwater pumping has been identified as a data gap and the GSP includes consideration of different methods to evaluate groundwater pumping. SGMA Annual Reports will need to document groundwater extraction for the entire basin.

Groundwater Charges

The groundwater charge for the USBR contract year (March 2020-February 2021) is recommended to be $13.15 per AF for agricultural use in Zone 6 and a groundwater charge of $39.40 per AF is recommended for M&I use The District adopts rates on a three-year cycle. Current water rates were adopted January 30, 2019.

Groundwater Production and Replenishment

Past District percolation operations helped to reverse historical overdraft and then accumulate a water supply reserve. The District currently manages groundwater storage and surface water to minimize excessively high or low groundwater elevations on a temporal and geographic basis. The District should continue to operate Hernandez and Paicines to improve downstream groundwater conditions. In 2018, the District provided off-channel percolation of CVP water; this too should be continued given availability of CVP water and persistence of local low groundwater levels. Basin-wide analysis of opportunities for additional percolation (i.e., managed aquifer recharge) would support development of additional percolation capacity to capture surface water when available. Given the decreased reliability of imported supplies and continuing threat of drought, such replenishment operations are critical to sustainable groundwater supply.

8-REFERENCES

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APPENDIX A REPORTING REQUIREMENTS

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Table A-1. District Zones of Benefit

Table A-2. Special Topics in Previous Annual Reports

APPENDIX A REPORTING REQUIREMENTS

The San Benito County Water District Act (1953) is codified in California Water Code Appendix 70. Section 70-7.6 authorizes the District Board of Directors to require the District to prepare an annual groundwater report; this report addresses groundwater conditions of the District and its zones of benefit (**Table A-1**) for the water year, which begins October 1 of the preceding calendar year and ends September 30 of the current calendar year. The Board has consistently ordered preparation of Annual Reports, and the reports have included the contents specified Section 70-7.6:

- An estimate of the annual overdraft for the current water year and for the ensuing water year
- Information for the consideration of the Board in its determination of the annual overdraft and accumulated overdraft as of September 30 of the current year
- A report as to the total production of water from the groundwater supplies of the District and its zones as of September 30 of the current year
- Information for the consideration of the Board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the District and its zones
- The amount of water the District is obligated to purchase during the ensuing water year
- A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the District and its zones during the ensuing water year
- A recommendation as to whether or not a groundwater charge should be levied in any zone(s) of the District in the ensuing water year and if so, a rate per acre-foot for all water other than agricultural water for such zone(s)
- Any other information the Board requires.
- The full text of Appendix 70, Section 70-7.6 through 7.8 is enclosed at the end of this appendix.
- Each water year a special topic is identified for further consideration. These topics have included water quality, salt loading, shallow wells, and others. Additional analyses and documentation provided in previous annual reports are summarized in **Table A-2.**

District management of water resources is focused on three Zones of Benefit, listed below.

Table A-1. District Zones of Benefit

Zone	Area	Provides
1	Entire County	Specific District administrative expenses
3	San Benito River Valley (Paicines to San Juan) and Tres Pinos River Valley (Paicines to San Benito River)	Operation of Hernandez and Paicines reservoirs and related groundwater recharge and management activities
6	San Juan, Hollister East, Hollister West, Pacheco, Bolsa SE, and Tres Pinos subbasins	Importation and distribution of CVP water and related groundwater management activities

Table A-2. Special Topics in Previous Annual Reports

APPENDIX A REPORTING REQUIREMENTS

Water Year	Additional Analyses and Reporting
2000	Methodology to calculate water supply benefits of Zone 3 and 6 operations
2001	Preliminary salt balance
2002	Investigation of individual salt loading sources
2003	Documentation of nitrate in supply wells, drains, monitor wells, San Juan Creek
2004	Documentation of depth to groundwater in shallow wells
2005	Tabulation of waste discharger permit conditions and recent water quality monitoring results
2006	Rate study
2007	Water quality update
2008	Water budget update
2009	Water demand and supply
2010	Water quality update
2011	Water budget update
2012	Land use update
2013	Water quality update
2014	Water balance update and Groundwater Sustainability
2015	Groundwater Sustainability – Basin Boundaries and GSAs
2016	Water quality update
2017	Water budget update
2018	GSP Update
2019	Water quality update

Water Code Appendix 70 Excerpts

Section 70-7.6. Groundwater; investigation and report: recommendations San Benito County

Sec. 7.6. the board by resolution require the district to annually prepare an investigation and report on groundwater conditions of the district and the zones thereof, for the period from October 1 of the preceding calendar year through September 30 of the current year and on activities of the district for protection and augmentation of the water supplies of the district and the zones thereof. The investigation and report shall include all of the following information:

(a) Information for the consideration of the board in its determination of the annual overdraft.

(b) Information for the consideration of the board in its determination of the accumulated overdraft as of September 30 of the current calendar year.

(c) A report as to the total production of water from the groundwater supplies of the district and the zones thereof as of September 30 of the current calendar year.

(d) An estimate of the annual overdraft for the current water year and for the ensuing water year.

(e) Information for the consideration of the board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the district and the zones thereof for the ensuing water year.

(f) The amount of water the district is obligated to purchase during the ensuing water year.

(g) A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the district and the zones thereof the ensuing water year.

(h) A recommendation as to whether or not a groundwater charge should be levied in any zone or zones of the district during the ensuing year.

(i) If any groundwater charge is recommended, a proposal of a rate per acre-foot for agricultural water and a rate per acre-foot for all water other than agricultural water for such zone or zones.

(j) Any other information the board requires.

(Added by Stats. 1965, c. 1798, p.4167, 7. Amended by Stats.1967,c.934, 5, eff. July27,1967; Stats. 1983, c. 402, 1; Stats. 1998, c. 219 (A.B.2135), 1.)

Section 70-7.7. Receipt of report; notice of hearing; contents; hearing

Sec. 7.7. (a) On the third Monday in December of each year, the groundwater report shall be delivered to the clerk of the board in writing. The clerk shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of a public hearing to be held on the second Monday of January of the following year in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding the groundwater report shall be held. The notice shall include, but is not limited to, an invitation to all operators of water producing facilities within the district to call at the offices of the district to examine the groundwater report.

(b) The board shall hold, on the second Monday of January of each year, a public hearing, at which time any operator of a water-producing facility within the district, or any person interested in the condition of the groundwater supplies or the surface water supplies of the district, may in person, or by representative, appear and submit evidence concerning the groundwater conditions and the surface water supplies of the district. Appearances also may be made supporting or protesting the written groundwater report, including, but not limited to, the engineer's recommended groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4167, 8. Amended by Stats. 1983, c. 02,2; Stats. 1998, c. 219 (A.B.2135,2.)

Section 70-7.8. Determination of groundwater charge; establishment of rates; zones; maximum charge; clerical errors

Sec. 7.8. (a) Prior to the end of the water year in which a hearing is held pursuant to subdivision (b) of Section 7.7, the board shall hold a public hearing, noticed pursuant to Section 6061 of the government Code, to determine if a groundwater charge should be levied, it shall levy, assess, and affix such a charge or charges against all persons operating groundwater- producing facilities within the zone or zones during the ensuing water year. The charge shall be computed at fixed and uniform rate per acre-foot for agricultural water, and at a fixed and uniform rate per acre-foot for all water other than agricultural water. Different rates may be established in different zones. However, in each zone, the rate for agricultural water shall be fixed and uniform and the rate for water other than agricultural water shall be fixed and uniform. The rate for agricultural water shall not exceed one-third of the rate for all water other than agricultural water.

(b) The groundwater charge in any year shall not exceed the costs reasonably borne by the district in the period of the charge in providing the water supply service authorized by this act in the district or a zone or zones thereof.

(c) Any groundwater charge levied pursuant to this section shall be in addition to any general tax or assessment levied within the district or any zone or zones thereof.

(d) Clerical errors occurring or appearing in the name of any person or in the description of the water-producing facility where the production of water there from is otherwise properly charged, or in the making or extension of any charge upon the records which do not affect the substantial rights of the assesse or assesses, shall not invalidate the groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4168, 9. Amended by Stats. 1983, c. 402, 3; Stats.1983, c. 402, 3; Stats. 1998, c. 219 (A.B.2135), 3.)

Section 70-7.7. Receipt of report; notice of hearing; contents; hearing

Sec. 7.7. (a) On the third Monday in December of each year, the groundwater report shall be delivered to the clerk of the board in writing. The clerk shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of a public hearing to be held on the second Monday of January of the following year in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding the groundwater report shall be held. The notice shall include, but is not limited to, an invitation to all operators of water producing facilities within the district to call at the offices of the district to examine the groundwater report.

(b) The board shall hold, on the second Monday of January of each year, a public hearing, at which time any operator of a water-producing facility within the district, or any person interested in the condition of the groundwater supplies or the surface water supplies of the district, may in person, or by representative, appear and submit evidence concerning the groundwater conditions and the surface water supplies of the district. Appearances also may be made supporting or protesting the written groundwater report, including, but not limited to, the engineer's recommended groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4167, 8. Amended by Stats. 1983, c. 02,2; Stats. 1998, c. 219 (A.B.2135,2.)

Section 70-7.8. Determination of groundwater charge; establishment of rates; zones; maximum charge; clerical errors

Sec. 7.8. (a) Prior to the end of the water year in which a hearing is held pursuant to subdivision (b) of Section 7.7, the board shall hold a public hearing, noticed pursuant to Section 6061 of the government Code, to determine if a groundwater charge should be levied, it shall levy, assess, and affix such a charge or charges against all persons operating groundwater- producing facilities within the zone or zones during the ensuing water year. The charge shall be computed at fixed and uniform rate per acre-foot for agricultural water, and at a fixed and uniform rate per acre-foot for all water other than agricultural water. Different rates may be established in different zones. However, in each zone, the rate for agricultural water shall be fixed and uniform and the rate for water other than agricultural water shall be fixed and uniform. The rate for agricultural water shall not exceed one-third of the rate for all water other than agricultural water.

(b) The groundwater charge in any year shall not exceed the costs reasonably borne by the district in the period of the charge in providing the water supply service authorized by this act in the district or a zone or zones thereof.

(c) Any groundwater charge levied pursuant to this section shall be in addition to any general tax or assessment levied within the district or any zone or zones thereof.

(d) Clerical errors occurring or appearing in the name of any person or in the description of the water-producing facility where the production of water there from is otherwise properly charged, or in the making or extension of any charge upon the records which do not affect the substantial rights of the assesse or assesses, shall not invalidate the groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4168, 9. Amended by Stats. 1983, c. 402, 3; Stats.1983, c. 402, 3; Stats. 1998, c. 219 (A.B.2135), 3.)

APPENDIX B CLIMATE DATA

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Table B-2. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Table B-1. Monthly Precipitation at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	0.12	0.01	2.21	4.38	4.52	1.56	1.33	1.32	0.00	0.01	0.00	0.00	15.46	116%
1997	0.96	3.16	4.26	6.84	0.21	0.09	0.19	0.02	0.10	0.00	0.00	0.03	15.86	119%
1998	0.16	3.78	2.59	4.94	9.06	2.70	2.31	2.40	0.09	0.02	0.00	0.08	28.13	212%
1999	0.54	1.93	0.79	2.54	2.49	1.52	0.67	0.06	0.07	0.00	0.00	0.00	10.61	80%
2000	0.14	0.98	0.11	4.05	4.53	0.68	0.40	0.45	0.10	0.00	0.00	0.02	11.46	86%
2001	3.54	0.80	0.23	2.86	2.77	0.62	2.20	0.01	0.01	0.03	0.02	0.00	13.09	99%
2002	0.70	11.48	11.93	0.66	1.15	1.57	0.37	0.28	0.00	0.00	0.00	0.00	28.14	212%
2003	0.00	1.67	5.04	0.77	1.41	1.06	3.05	0.06	0.00	0.00	0.06	0.00	13.12	99%
2004	0.20	0.60	5.25	1.31	4.21	0.59	0.27	0.08	0.01	0.00	0.00	0.01	12.53	94%
2005	1.95	0.54	3.46	2.49	2.89	3.42	0.83	0.64	0.43	0.00	0.00	0.04	16.69	126%
2006	0.07	0.27	3.08	1.49	1.01	4.96	1.73	0.39	0.01	0.00	0.02	0.01	13.04	98%
2007	0.20	0.73	1.69	0.57	2.22	0.29	0.55	0.02	0.00	0.02	0.00	0.43	6.72	51%
2008	0.71	0.67	0.92	4.56	2.06	0.09	0.06	0.00	0.00	0.00	0.00	0.00	9.07	68%
2009	0.28	1.05	1.89	0.35	3.73	1.83	0.20	0.47	0.00	0.00	0.00	0.15	9.95	75%
2010	0.50	0.02	1.31	2.29	2.19	1.74	3.44	0.61	0.00	0.01	0.00	0.00	12.11	91%
2011	0.72	1.85	2.59	1.57	2.63	2.33	0.19	0.78	0.30	0.00	0.00	0.00	12.96	98%
2012	0.69	0.96	0.07	0.81	0.46	2.34	1.39	0.26	0.09	0.00	0.00	0.00	7.07	53%
2013	0.01	2.23	1.15	1.35	0.64	0.46	0.30	0.02	0.01	0.00	0.03	0.10	6.30	47%
2014	0.07	0.37	0.17	0.22	1.91	1.59	0.86	0.02	0.00	0.00	0.00	0.14	5.35	40%
2015	1.57	0.48	5.78	0.02	1.20	0.22	0.24	0.87	0.00	0.01	0.09	0.08	10.56	80%
2016	0.22	3.65	1.58	3.98	0.57	3.72	0.79	0.05	0.08	0.08	0.06	0.10	14.88	112%
2017	1.77	2.48	3.33	4.66	6.05	1.70	1.09	0.50	0.32	0.00	0.02	0.00	21.92	165%
2018	0.20	1.12	0.19	2.39	0.29	2.74	1.33	0.00	0.00	0.00	0.00	0.00	8.26	62%
2019	0.17	2.52	1.48	2.24	4.02	2.55	0.25	1.95	0.20	0.00	0.00	0.00	15.38	116%
AVG	0.65	1.81	2.55	2.39	2.59	1.68	1.00	0.47	0.08	0.01	0.01	0.05	13.28	100%

-The CIMIS value for September 2017 (2.4") includes measurement error due to irrigation overspray. The corrected District value is 0".

-The CIMIS value for February, May, June, and August 2018 (0.8", 2.6", 0.1", 0.03") includes measurement error due to irrigation overspray. The corrected District value is 0.3" for February and 0" for all other months.

-The CIMIS value for October and November 2018 included measurement error due to irrigation overspray. The corrected District value is 0.17" for October and 2.52" for November (WRCC Hollister2 Station)

Table B-2. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	3.88	2.24	1.22	1.48	1.88	3.67	5.10	6.06	6.73	7.39	6.68	4.71	51.04	104%
1997	3.84	1.84	1.37	1.38	2.48	4.27	5.84	7.51	7.13	7.18	6.71	5.67	55.22	112%
1998	3.85	1.84	1.52	1.29	1.38	2.82	4.26	4.53	5.27	6.91	6.83	4.72	45.22	92%
1999	3.51	1.73	1.52	1.54	1.84	3.01	4.72	5.80	6.66	6.92	5.91	4.67	47.83	97%
2000	4.00	1.98	1.89	1.22	1.62	3.69	5.14	6.04	6.73	6.74	6.19	4.74	49.98	102%
2001	2.91	1.71	1.47	1.47	1.81	3.07	3.90	6.15	6.54	6.02	6.23	4.75	46.03	94%
2002	3.51	1.91	1.24	1.53	2.26	3.66	4.21	6.37	7.05	7.24	6.14	5.39	50.51	103%
2003	3.57	1.94	1.25	1.56	1.80	3.87	3.79	6.00	6.47	7.29	6.15	5.07	48.76	99%
2004	4.11	1.73	1.24	1.32	1.72	3.98	5.19	6.38	6.71	6.63	5.98	5.32	50.31	102%
2005	3.08	1.69	1.44	1.30	1.69	2.95	4.38	5.74	6.36	6.86	6.13	4.55	46.17	94%
2006	3.59	2.00	1.19	1.43	2.18	2.43	3.00	5.49	6.41	7.02	5.60	4.38	44.72	91%
2007	3.28	1.69	1.37	1.77	1.77	4.11	4.76	6.29	6.89	6.79	6.46	4.65	49.83	101%
2008	3.48	2.21	1.44	1.25	2.03	3.76	5.17	5.97	6.88	6.74	6.31	5.00	50.24	102%
2009	3.82	1.87	1.36	1.70	1.72	3.51	4.83	5.53	6.31	7.08	6.31	5.30	49.34	100%
2010	3.45	2.21	1.71	1.26	1.80	3.49	3.87	5.37	6.71	6.29	5.88	4.98	47.02	96%
2011	3.02	1.86	1.05	1.59	2.05	2.71	4.43	5.34	5.99	6.56	5.74	4.64	44.98	91%
2012	3.27	1.89	1.83	1.84	2.46	3.34	4.39	6.39	6.81	6.63	6.00	4.60	49.45	101%
2013	3.25	1.82	1.16	1.50	2.10	3.71	5.39	6.26	6.36	6.46	5.98	4.83	48.82	99%
2014	3.51	2.02	1.80	2.08	1.85	3.58	4.89	6.83	6.61	6.43	6.02	4.74	50.36	102%
2015	3.90	1.86	1.45	1.80	2.16	4.13	5.12	5.01	6.41	6.52	6.49	5.34	50.19	102%
2016	4.11	2.05	1.39	1.32	2.72	3.40	4.65	5.71	7.54	7.22	5.74	5.15	51.00	104%
2017	3.40	2.11	1.47	1.55	1.76	3.73	4.45	6.29	6.82	7.62	6.03	5.16	50.39	102%
2018	4.15	1.93	1.98	1.57	2.66	3.25	4.81	5.83	7.29	7.65	6.60	5.15	52.87	107%
2019	3.85	2.20	1.54	1.58	1.91	3.42	4.81	5.17	6.68	7.15	6.54	5.36	50.21	102%
AVG	3.60	1.93	1.45	1.51	1.99	3.48	4.63	5.92	6.64	6.89	6.19	4.95	49.19	100%

Note: The averages are for the available period of record, 1995 for reference evapotranspiration.

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Well Number	Well Depth (feet)	Depth to Top of Screens (feet)	Subbasin	Groundwater Elevations (feet MSL)				
				Oct-18	Jan-19	Apr-19	Jul-19	Oct-19
Southern Management Area								
14-6-14Q	UNK	UNK	Paicines	617.68	630.06	632.73	616.75	634.54
14-6-35B	UNK	UNK	Paicines	657.82	655.13	655.10	653.05	654.95
14-6-26K1	UNK	UNK	Paicines	635.10	634.73	637.68	634.32	642.55
14-6-26F	UNK	UNK	Paicines	638.25	639.00	639.90	634.15	644.82
14-6-26H1	UNK	UNK	Paicines	608.26	634.26	638.31	629.81	640.10
1536	UNK	UNK	TPCV	293.00	299.00	297.50	298.00	298.00
14-6-13B	UNK	UNK	TPCV	636.43	639.68	642.43	640.38	648.16
GRANITE ROCK WELL 1	UNK	UNK	TPCV	305.50	307.40	313.60	306.32	312.40
GRANITE ROCK WELL 2	UNK	UNK	TPCV	315.90	318.68	338.20	327.50	337.00
San Justo 5	UNK	UNK	TPCV	275.40	275.18	275.52	275.08	275.45
14-7-19G	UNK	UNK	TPCV	NM	NM	NM	NM	711.34
14-7-20K	UNK	UNK	TPCV	711.50	715.75	716.50	712.75	719.25
San Juan Management Area								
12-4-17L20	UNK	UNK	SJ	118.85	122.47	122.37	123.19	120.47
12-4-18J1	UNK	UNK	SJ	122.62	124.00	127.00	123.75	123.04
12-4-20C3	UNK	UNK	SJ	109.97	106.90	113.82	113.67	111.83
12-4-21M1	250	UNK	SJ	142.62	145.29	144.98	141.25	142.38
12-4-26G1	876	240	SJ	154.25	156.75	157.00	155.75	148.25
12-4-34H1	387	120	SJ	156.65	167.30	175.18	147.50	151.72
12-4-35A1	325	110	SJ	174.05	188.00	195.60	169.34	172.55
12-5-30H1	240	UNK	SJ	204.75	205.05	205.64	206.64	206.22
12-5-30R1	199	87	SJ	NM	NM	NM	NM	366.50
12-5-31H1	UNK	UNK	SJ	198.60	204.00	210.10	194.47	199.53
13-4-03H1	312	168	SJ	156.10	165.75	172.58	147.33	149.77
13-4-4A3	UNK	UNK	SJ	188.05	189.43	193.28	192.65	191.20
RIDER BERRY	UNK	UNK	SJ	146.67	159.98	-77.33	-86.68	146.15
Bolsa Management Area								
11-4-25H1	UNK	UNK	B	23.70	130.79	117.58	64.20	75.30
11-4-34A1	100	UNK	B	127.75	128.65	138.75	130.50	132.77
11-5-20N1	300	UNK	B	71.31	111.60	112.72	59.15	68.84
11-5-21E2	220	100	B	155.00	155.00	155.00	155.00	155.00
11-5-27P2	331	67	B	168.50	168.72	174.69	169.73	170.40
11-5-28B1	198	125	B	168.00	168.00	168.00	168.00	168.00
11-5-28P4	140	80	B	165.00	165.00	165.00	165.00	165.00
11-5-31F1	515	312	B	67.45	94.87	88.66	49.30	57.18
11-5-33B1	125	UNK	B	169.00	169.00	169.00	169.00	169.00
12-5-05G1	500	150	B	NM	NM	NM	NM	107.07
12-5-05M1	UNK	UNK	B	61.38	83.00	66.62	45.90	58.32
12-5-06L1	UNK	UNK	B	145.22	146.04	149.16	145.89	147.00
12-5-07P1	750	360	B	50.00	51.00	71.00	47.20	68.00
12-5-17D1	950	314	B	67.00	68.50	79.00	65.00	75.00
Llagas - SCVWD								
11S04E02D008	UNK	UNK	SCVWD	142.70	160.95	162.23	137.04	146.30
11S04E02N001	UNK	UNK	SCVWD	134.76	155.81	154.66	119.43	139.58
11S04E03J002	UNK	UNK	SCVWD	140.40	160.35	160.82	132.06	144.86
11S04E08K002	UNK	UNK	SCVWD	145.00	159.10	163.79	151.31	152.07
11S04E10D004	UNK	UNK	SCVWD	137.92	156.82	157.41	139.01	145.57
11S04E15J002	UNK	UNK	SCVWD	123.06	NM	NM	123.79	133.15
11S04E17N004	UNK	UNK	SCVWD	144.93	159.83	163.32	151.18	151.63
11S04E21P003	UNK	UNK	SCVWD	132.78	146.92	149.90	136.08	141.44
11S04E22N001	UNK	UNK	SCVWD	128.03	141.80	141.18	121.94	123.96
11S04E32R002	UNK	UNK	SCVWD	121.35	133.42	131.79	117.40	120.89

Table C-1. Groundwater Elevations October 2018 through October 2019								
Well Number	Well Depth (feet)	Depth to Top of Screens (feet)	Subbasin	Groundwater Elevations (feet MSL)				
				Oct-18	Jan-19	Apr-19	Jul-19	Oct-19
Hollister Management Area								
12-5-09M1	240	105	BSE	123.65	124.26	125.31	122.22	124.87
2317	UNK	UNK	HE	222.68	223.90	224.56	222.89	224.50
12-5-22C1	237	102	HE	169.68	177.49	181.72	119.62	176.00
12-5-22J2	355	120	HE	199.45	191.97	193.35	192.60	192.45
12-5-23A20	862	178	HE	181.00	181.50	183.20	186.68	184.00
12-5-36B20	500	430	HE	191.03	NM	197.14	194.75	199.23
12-6-07P1	147	UNK	HE	240.20	243.86	248.69	244.59	243.56
12-6-18G1	198	70	HE	277.20	268.98	278.18	271.44	265.30
12-6-30E1	UNK	UNK	HE	347.54	348.10	348.80	346.83	347.90
13-6-07D2	UNK	UNK	HE	337.90	338.50	338.39	334.85	338.25
ROSSI 1	UNK	UNK	HE	228.97	231.23	237.38	232.00	231.60
12-5-27E1	175	UNK	HW	198.78	202.90	204.76	200.12	201.73
12-5-28J1	220	UNK	HW	210.70	213.64	214.35	213.60	215.00
12-5-28N1	408	168	HW	217.66	NM	220.48	216.16	222.66
12-5-33E2	121	81	HW	211.78	213.50	214.10	215.00	216.00
12-5-34P1	195	153	HW	217.55	219.50	219.10	215.50	220.00
13-5-03L1	126	UNK	HW	225.60	226.55	227.00	229.80	231.00
13-5-04B	UNK	UNK	HW	226.80	228.21	232.48	229.73	230.35
13-5-10B1	UNK	UNK	HW	215.55	216.85	217.52	216.00	220.50
13-5-10L1	252	52	HW	NM	312.00	NM	NM	292.04
13-5-11E1	UNK	UNK	HW	277.30	279.25	281.38	284.79	281.68
San Justo 4	UNK	UNK	HW	271.38	274.70	272.55	271.05	272.10
San Justo 6	UNK	UNK	HW	234.16	235.37	233.65	231.79	236.15
11-5-26N2	232	95	P	168.65	171.62	174.90	171.60	171.00
11-5-26R3	225	65	P	177.49	181.09	185.97	183.49	188.96
11-5-35C1	180	UNK	P	169.70	171.21	180.00	173.27	157.52
11-5-35G1	230	UNK	P	179.25	180.65	185.70	183.30	182.20
11-5-35Q3	UNK	UNK	P	167.78	175.10	169.87	158.89	170.00
11-5-36C1	98	UNK	P	194.00	193.25	198.14	196.39	195.40
11-5-36M1	UNK	UNK	P	180.38	181.50	187.90	184.25	183.90
11-6-31M2	188	155	P	230.98	227.25	234.13	231.31	236.52
12-5-01G2	300	UNK	P	180.40	186.90	184.30	183.73	183.65
12-5-02H5	128	42	P	176.80	177.64	184.82	180.37	182.79
12-5-02L2	170	UNK	P	192.42	193.72	198.55	197.29	195.05
12-5-03B1	128	100	P	182.00	182.00	182.00	182.00	182.00
12-6-06K1	260	16	P	260.00	260.00	260.00	260.00	260.00
12-6-06L4	235	50	P	218.12	219.90	220.51	215.00	220.40
13-5-11Q1	178	61	TP	NM	NM	NM	NM	294.37
13-5-12D4	UNK	UNK	TP	234.50	249.00	252.00	239.00	229.00
13-5-12K1	UNK	UNK	TP	321.90	325.00	325.90	328.00	328.00
13-5-12N20	352	301	TP	308.32	315.44	316.75	318.75	319.63
13-5-13F1	134	30	TP	323.61	333.10	335.74	333.70	334.13
13-5-13H1	252	112	TP	NM	NM	NM	NM	344.80
13-5-13J2	180	UNK	TP	325.24	328.22	329.35	347.25	347.08
13-5-13Q1	185	44	TP	NM	NM	NM	NM	333.00
13-5-14C1	UNK	UNK	TP	NM	NM	NM	NM	293.00
13-6-19J1	340	128	TP	429.03	434.20	436.32	434.41	435.17
13-6-19K1	211	UNK	TP	357.50	359.75	361.08	357.75	360.84
13-6-20K1	UNK	UNK	TP	426.20	424.55	427.75	426.38	429.03
11-5-13D1	125	UNK	PC	190.07	217.25	233.77	228.33	227.31
11-5-23R2	118	43	PC	NM	NM	NM	NM	206.68
11-5-24C1	134	UNK	PC	207.35	205.36	NM	NM	212.97
11-5-24C2	165	70	PC	216.33	215.38	227.81	226.15	223.00
11-5-24L1	70	UNK	PC	211.75	212.68	213.39	211.15	207.63
11-5-25G1	225	UNK	PC	210.73	210.97	210.83	213.27	208.41

UNK - Unknown
NM - Not Monitored

Table C-2. Groundwater Change Attributes

Subbasin	Subbasin Area (Acres)	Average Storativity
San Juan	11,708	0.05
Hollister West	6,050	0.05
Tres Pinos	4,725	0.05
Pacheco	6,743	0.03
Northern Hollister East	10,686	0.03
Southern Hollister East	5,175	0.03
Bolsa SE	2,691	0.08
Bolsa	20,003	0.01

Table C-3. Groundwater Change in Elevation 2006-2019 (feet)

	Average Change in Groundwater Elevation													
Subbasin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
San Juan	0.9	(4.5)	0.3	(0.7)	(1.4)	(0.9)	0.0	(10.7)	(7.9)	(9.4)	(3.6)	14.6	3.5	(1.7)
Hollister West	3.1	(1.7)	3.3	(1.4)	(1.6)	(0.7)	2.1	(5.7)	(17.4)	(3.6)	0.9	6.9	9.5	6.5
Tres Pinos	2.5	(2.3)	0.7	8.1	(10.5)	1.0	2.5	(2.5)	(6.7)	(6.7)	(6.0)	4.4	0.9	15.0
Pacheco	1.9	(4.4)	(1.4)	8.1	(6.6)	1.9	(4.4)	(3.0)	(7.4)	1.9	3.0	8.6	(2.4)	1.8
Northern Hollister East	3.6	(6.5)	(4.2)	10.1	(8.7)	2.7	(2.4)	1.6	(9.1)	0.8	(1.5)	5.8	2.6	0.6
Southern Hollister East	3.3	(1.5)	5.5	9.4	4.9	(1.9)	(2.2)	(1.1)	(6.9)	1.6	8.1	0.5	7.2	2.4
Bolsa SE	1.5	(6.8)	11.5	(24.8)	25.3	(11.6)	0.2	(4.3)	(10.7)	(3.3)	(9.9)	8.2	7.2	3.2
Bolsa	6.8	(3.3)	9.0	(16.9)	23.2	(11.2)	10.7	(3.4)	(25.6)	4.6	(2.9)	10.6	(2.6)	(0.6)

Table C-4. Groundwater Change in Storage 2006-2019 (acre-feet)

	Average Change in Groundwater Storage (AF)													
Subbasin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
San Juan	510	(2,626)	168	(437)	(811)	(523)	0	(6,239)	(4,653)	(5,530)	(2,086)	8,531	2,077	(1,016)
Hollister West	947	(510)	1,001	(431)	(477)	(198)	640	(1,730)	(5,267)	(1,090)	282	2,084	2,878	1,962
Tres Pinos	584	(553)	169	1,913	(2,485)	228	601	(586)	(1,574)	(1,579)	(1,427)	1,034	216	3,552
Pacheco	391	(892)	(275)	1,639	(1,335)	389	(882)	(597)	(1,490)	388	604	1,736	(488)	362
Northern Hollister East	1,167	(2,087)	(1,350)	3,253	(2,798)	870	(757)	528	(2,918)	242	(474)	1,867	818	203
Southern Hollister East	506	(227)	846	1,457	766	(301)	(339)	(177)	(1,067)	250	1,263	72	1,123	365
Bolsa SE	333	(1,458)	2,478	(5,338)	5,443	(2,508)	53	(918)	(2,300)	(719)	(2,139)	1,767	1,543	695
Bolsa	1,358	(659)	1,794	(3,372)	4,631	(2,239)	2,144	(674)	(5,112)	915	(578)	2,125	(514)	(112)

Table C-5. SBCWD Monitoring Well Water Quality Data - Total Dissolved Solids (mg/L)

See Figure 3-6 for well locations

	Brian's Nested Well																										
Date	A	B	C	D	E	MW 11	MW 12	MW 17	MW 18	MW 19	MW 21	MW 24	MW 28	MW 31	MW 36	MW 39	MW 41	MW 42	MW 43	MW 45	MW 46	MW 47	MW 48	MW 49	MW 51	MW 52	MW 1202
													Total Dissolved Solids (TDS)														
Apr-97											1,500	2,300															
Aug-98						1,010	1,160	600	800		1,720	2,780								840							
Sep-01						1,175	1,220	543	810	1,168	2,100	2,482	875		1,173	852	2,135	347	493	845	593		1,098				
Oct-01														1,360								2,032					
Jan-02						1,156	1,292	538				2,786	948	1,376	1,178	816	2,032	360	564	836	582	1,774		1,084			
Mar-02																							1,078				
Apr-02						1,180	1,266	538		1,398	1,630	538	926	1,352	1,152	782	1,964	368	726	824	582	1,760	1,090	932			
Jul-02						1,216	1,216	542		1,114	1,676	2,506	926	1,386	1,170	868	2,014	354	724	806	594	1,996		1,078			
Oct-02						1,178	1,186	570		1,120	2,052		926	1,326	1,178	1,014		394	532	834	628	1,862	1,084	1,020			
Jan-03						1,056	1,086	516		966	2,024	2,448	870	1,198	1,094	838	1,970	346	470	768	550	1,548	1,046	746			
Apr-03						1,182	1,294	514		1,140	2,072	2,736	914	1,444	1,132	900	2,092	362	528	818	598	1,892	1,076	976			
Jul-03						1,244	1,312	542		1,084	1,640	2,692	950	1,376	1,180	888	2,144	372	546	802	610	2,004	856	1,004			
Aug-03																1,000											
Oct-03						1,188	1,164	556		1,110	2,110	3,064	892	1,424	1,200	942	2,144	394	526	836	628	1,888	966	948			
Jan-04						1,218	1,316	528	774		1,766	2,910	870	1,282	1,156	844	2,074	380	502	798			1,058	902			
Nov-04						1,302	1,372	544	740		1,936	3,470	946	1,336	1,202	888	2,128	368	540	854	568	2,194		1,012			
May-05						1,168	1,308	518	706		1,574	2,250	886	1,178	1,112	866	2,092	374	542	874	580	1,964		768			
Nov-05						1,246	1,398	532	774	1,114	1,874	3,544	888	1,390	1,232	982	2,110	386	562	854	590	2,208	1,034	876			
Apr-06						1,184		528	818		2,006	3,120	902	1,280	1,178	922	2,076	372	548	902	592	1,958		904			
Oct-06						1,292	1,294	666	786	1,460	1,090	2,826	1,012	1,374	1,074	940	1,924	440	630	758	628	1,772	676				
Feb-07	2,440	1,302	1,372	1,128	1,410																						
Apr-07						1,088		526	762			2,486	664	1,242	1,096	980	2,030	264	528	780	566	1,848					
Nov-07						882		476	616		1,256	2,024	656	900	886	782	1,434	316	466	696	512	1,414		654			
Apr-08						1,076							810	970				370	546		562						
May-08											1,462	2,528			1,102	872				814		1,782					
Nov-08						1,064		560				3,036	856	2,152	868	1,116	2,400	372	568	860		1,536		400			
Apr-09						1,112	916	528			312	2,780	848	2,068	2,428	1,100	860	346		780	568	1,772		728	644		
Oct-09						1,024	548	576		1,092	360	2,864		2,088	848	1,444	1,040	352	528	656	1,008	1,436			656	768	
Nov-09	1,136	1,140	1,160	1,108	1,148																						
Apr-10						955	955	555		422	343	1,783	850	2,032	330			363		815		1,812		688	695	794	
Oct-10	1,105	887		1,000	753	1,168		528		967	352	2,683	335	1,928		1,057		368	528	815	572	1,215			703	843	
Apr-11						1,192	1,168	524		944	348	2,752	868	1,784	732	1,120		376	532	560	848	1,600		660	704	764	
Jun-11	772	1,028	644	2,764	724																						
Nov-11								532		932			848	1,648				368	468	796	548			232	320	704	
Dec-12						1,096	1,580	516			288	1,348	824	1,648	720			376	508	892	512	1,760			788	1,032	
Jun-13	796	600	624	936	2,784	1,124		500			348	2,444	1,028	1,820	480	964		368	520					1,028	712	840	
Dec-13						1,012		524				2,520	320	1,704		916			536	800	544	1,344		552	708	744	
Jan-14	928	792	992	1,112	2,868																						
May-14	808	568	1,004	1,564	2,880	1,208	1,232	536			352	2,756	712	1,720		912		388	556	856				540	840		
Nov-14	900	820	888	1,816	2,880			548				2,904	704	2,000				1,484	532	876	1,212				724	740	
May-15	916	812	856	1,696	2,860	1,160	1,204	560			356		708	1,960		992		798		868						900	
May-16	832	652	520	1,592	2,788	1,152	2,276	540		960	332	1,184	1,252	1,696		1,192		420			564				720	1,304	
Nov-16								536			316	2,840	656			1,412		1,900	484			1,328			676	684	
Nov-17						1,616		520			328	2,496	2,496	1,572		1,380		632	520	788	520	1,376			680	656	
Feb-18													240									1,300					
Jun-18						1,500	1,300	530		1,000	350	1,600	240	1,200		1,200		1,600	510		540	1,200				740	1,700
Nov-18						1,200	1,300			960	330	1,700	250	1,700		1,300			490		540	1,300		720			820
Dec-18	850	540	660	1,300	2,700																						
May-19				1,200		1,300		540		990	340	1,700	300	2,100		1,300		5,600	640		560	1,300					1,900
Jun-19	920	540	630		1,700																				730	400	

Note: Shading indicates values that exceed water quality goals (light green > 500 mg/L and dark green > 1,000 mg/L)

Table C-6. SBCWD Monitoring Well Water Quality Data - Nitrate as NO3 (mg/L)

See Figure 3-6 for well locations

	Brian's Nested Well																										
Date	A	B	C	D	E	MW 11	MW 12	MW 17	MW 18	MW 19	MW 21	MW 24	MW 28	MW 31	MW 36	MW 39	MW 41	MW 42	MW 43	MW 45	MW 46	MW 47	MW 48	MW 49	MW 51	MW 52	MW 1202
														NITRATE (AS NO3)													
Apr-97											32	170															
Aug-98							7	6	12		46	220								16							
Sep-01						15	14	3	17	16	83	228	2		8	15	4	31	3	24	3		12				
Oct-01														57								86					
Jan-02						21	13	2				242	2	53	8	12	2	30	2	20	2	124		106			
Mar-02																							32				
Apr-02						19	13	3		80	33	3	3	53	7	10	3	28	3	21	3	114	10	112			
Jul-02						17	14	3		15	37	199	3	54	9	16	3	30	3	24	3	122		111			
Oct-02						20	18	2		15	80		3	55	9	16		35	3	28	3	129	13	112			
Jan-03						17	17	4		4	66	336	4	56	11	13	4	35	4	22	4	122	13	104			
Apr-03						21	20	3		11	83	327	4	69	9	12	3	36	3	27	3	114	13	116			
Jul-03						20	17	3		3	37	108	3	57	7	15	3	33	3	22	3	123	3	98			
Aug-03																19											
Oct-03						19	18	3		5	75	228	3	53	8	14	3	33	4	25	3	120	8	94			
Jan-04						15	15	2	24		33	513	2	44	13	14	5	31	3	22			17	81			
Nov-04						16	19	2	8		61	259	2	44	5	7	2	35	2	20	2	101		82			
May-05						21	24	2	10		45	161	2	44	6	9	2	34	3	24	3	110		88			
Nov-05						19	23	3	14	9	57	321	4	47	7	10	3	33	3	23	4	103	11	78			
Apr-06						24		4	24		82	393	4	63	12	12	4	43	3	35	4	120		94			
Oct-06						22	18	5	22	76	47	501	3	53	8	14	4	35	4	25	5	140	14				
Feb-07	5	1	7	1	1																						
Apr-07						20		2	14			321	2	49	6	10	2	32	3	26	2	98					
Nov-07						23		5	14		42	295	4	31	9	12	4	33	3	29	3	128		74			
Apr-08						26							5	31				31	4		5						
May-08											36	225			17	15				25		99					
Nov-08						26		8				332	3	216	20	17	40	42	5	36		73		6			
Oct-09						30	2	7		19	23	3		175	8	27	44	32	2	7	12	53			7	2	
Nov-09	2	2	2	2	2																						
Apr-10						19	19	8		35	4	3	3	208	3			41		29		3		65	9	3	
Oct-10	4	5		4	4	30		13		10	5	301	5	225		11		39	5	27	4	36			10	4	
Apr-11						29	17	10		3	4	230	4	179	10	15		36	4	3	24	67		44	8	3	
Jun-11	7	4	4	17	3																						
Nov-11								11		5			4	170				33	4	26	4			4	5	5	
Dec-12						18	17	11			5	23	4	74	9			24	5	17	5	7			10	5	
Jun-13	6	5	6	5	25	28		19			6	180	31	211	9	14		36	5					31	14	6	
Dec-13						30		17				283	3	222		4			3	27	3	42		30	12	3	
Jan-14	3	3	3	2	15																						
May-14	3	3	3	2	18	30	16	18			2	302	2	212		3		35	3	24				13	3		
Nov-14	6	6	7	7	18			13				247	6	205				29	7	21	25				12	7	
May-15	5	5	5	8	19	26	18	13			5		5	215		5		23		25						6	
May-16	3	3	3	6	4	29	89	11		4	4	38	102	198		19		17	42		4				12	4	
Nov-16								12			6	302	5					34	8	10		42			14	4	
Nov-17						63		7			4	240	3	206		49		36	3		3	36			18	3	
Feb-18													5			34				22		36					
Jun-18						42	20	8		1	1	155	1	234				34	1		1	34				1	93
Nov-18						26				1	1	168	1	226		27			1		1	37		9			19
Dec-18	3	1	1	1	1																						
May-19				1		31	20	6		1	1	155	2	243		24		27	1		1	33					89
Jun-19	3	1	1		1																				9	8	

Note: Shading indicates values that exceed the primary MCL for drinking water

Table C-7. Water Quality Goals and Standards

Constituents of Concern	Units	Drinking Water Standards Maximum Contaminant Levels (MCLs)				Other Standards				
		State Water Resources Control Board		USEPA		California DHS			RWQCB Basin Plan Water Quality Objectives for Irrigation	
		Primary	Secondary	Primary	Secondary	Public Health Goal (PHG)	Action Level (AL)	Agricultural Water Quality Limits	Irrigation Supply	Livestock Watering
MAJOR CATIONS:										
calcium	mg/L	–	–	–	–	–	–	–	–	–
magnesium	mg/L	–	–	–	–	–	–	–	–	–
sodium	mg/L	–	–	–	–	–	–	69	–	–
potassium	mg/L	–	–	–	–	–	–	–	–	–
MAJOR ANIONS:										
chloride	mg/L	–	250	–	250	–	–	106	–	–
sulfate	mg/L	–	250	500	250	–	–	–	–	–
bicarbonate	mg/L	–	–	–	–	–	–	–	–	–
carbonate	mg/L	–	–	–	–	–	–	–	–	–
MINOR IONS:										
hydroxide (as CaCO3)	mg/L	–	–	–	–	–	–	–	–	–
iron	mg/L	–	0.3	–	0.3	–	–	0.5	5	–
manganese	mg/L	–	0.05	–	0.05	–	0.5	0.2	0.2	–
fluoride*	mg/L	2	–	4	2	1	–	1	1	2
nitrate as NO3 –	mg/L	45	–	–	–	–	–	–	–	–
nitrate as nitrogen	mg/L	–	–	10	–	10	–	–	–	–
nitrite (NO2 –) as nitrogen	mg/L	1	–	1	–	1	–	–	–	10
nitrate + nitrite as nitrogen	mg/L	10	–	10	–	10	–	–	–	100
PHYSICAL PROPERTIES:										
apparent color	Color Units	–	15	–	15	–	–	–	–	–
conductivity		–	900	–	–	–	–	700	–	–
odor	TON@60°C	–	3	–	3	–	–	–	–	–
total alkalinity (as CaCO3)	mg/L	–	–	–	–	–	–	–	–	–
total dissolved solids (TDS)	mg/L	–	500	–	500	–	–	450	–	–
total hardness (as CaCO3)	mg/L	–	–	–	–	–	–	–	–	–
turbidity	NTU	1/5**	5	1/5**	–	–	–	–	–	–
pH	SU	–	–	–	6.5 to 8.5	–	–	6.5 to 8.4	5.5 to 8.3	–
TRACE IONS:										
aluminum	mg/L	1	0.2	–	0.050 to 0.2	0.6	–	5	5	5
antimony	mg/L	0.006	–	0.006	–	0.02	–	–	–	–
arsenic	mg/L	0.05	–	0.01	–	0.000004	–	0.1	0.1	0.2
barium	mg/L	1	–	2	–	2	–	–	–	–
beryllium	mg/L	0.004	–	0.004	–	0.001	–	0.1	0.1	–
boron	mg/L	–	–	–	–	–	1	0.700/0.750†	0.5	5
cadmium	mg/L	0.005	–	0.005	–	0.00004	0.00007	–	0.01	0.05
chromium vi	ug/L	20	–	0.1	–	0.02	–	–	0.1	1
cobalt	mg/L	–	–	–	–	–	–	–	0.05	1
copper	mg/L	1.3	–	1.3	1	0.3	–	0.2	–	–
lead	mg/L	1.015	–	0.015	–	0.0002	–	5	5	0.1
lithium	mg/L	–	–	–	–	–	–	–	2.5	–
mercury	mg/L	0.002	–	0.002	–	0.0012	–	–	–	–
molybdenum	mg/L	–	–	–	–	–	–	–	0.01	0.5
nickel	mg/L	0.1	–	–	–	0.012	–	0.2	0	–
selenium	mg/L	0.05	–	0.5	–	–	–	0.002	–	–
silver	mg/L	–	–	–	0.1	–	–	–	0.02	0.05
thallium	mg/L	0.002	–	0.002	–	0.0001	–	–	–	–
uranium	ug/L	30	–	30	–	0.5	–	–	–	–
vanadium	mg/L	–	–	–	–	–	0.05	0.1	0.1	0.1
zinc	mg/L	–	5	–	5	–	–	2	2	25
VOCs:		–	–	–	–	–	–	–	–	–
1,1,1-trichloroethane	mg/L	1000	–	0.2	–	200	–	–	–	–
1,1,2-trichloro-1,2,2-trifluoroethane	mg/L	4000	–	1.2	–	1200	–	–	–	–
1,1,2-trichloroethane	mg/L	5	–	0.005	–	0.3	–	–	–	–
1,1-dichloroethane	mg/L	5	–	0.005	–	3	–	–	–	–
1,1-dichloroethene	mg/L	6	–	0.006	–	10	–	–	–	–
1,2,3-trichlorobenzene	mg/L	–	–	0	–	–	–	–	–	–
1,2,4-trichlorobenzene	mg/L	–	–	0.005	–	–	–	–	–	–
1,2-dichlorobenzene	mg/L	0.5	–	0.6	–	0.4	–	–	–	–
1,2-dichloroethane	mg/L	–	–	0.0005	–	–	–	–	–	–
1,2-dichloropropane	mg/L	–	–	0.005	–	–	–	–	–	–
1,3-dichlorobenzene	mg/L	–	–	0.6	–	–	0.6	–	–	–
chlorobenzene	mg/L	–	–	0.07	–	–	–	–	–	–
di(2-ethylhexyl)phthalate	mg/L	–	–	0.004	–	–	–	–	–	–

Table C-7. Water Quality Goals and Standards

Constituents of Concern	Units	Drinking Water Standards Maximum Contaminant Levels (MCLs)				Other Standards				
		State Water Resources Control Board		USEPA		California DHS			RWQCB Basin Plan Water Quality Objectives for Irrigation	
		Primary	Secondary	Primary	Secondary	Public Health Goal (PHG)	Action Level (AL)	Agricultural Water Quality Limits	Irrigation Supply	Livestock Watering
dichlorodifluoromethane	mg/L	–	–	1	–	–	–	–	–	–
PCE	mg/L	–	–	0.005	–	–	–	–	–	–
TCE	mg/L	0.005	–	0.005	–	0.0017	–	–	–	–
trans-1,2-dichloroethene	mg/L	–	–	0.01	–	–	–	–	–	–
trichlorofluoromethane	mg/L	–	–	0.15	–	–	–	–	–	–
vinyl chloride	mg/L	0.5	–	0.0005	–	0.05	–	–	–	–
BTEX:										
MTBE	mg/L	–	–	0.013	–	–	–	–	–	–
Benzene	mg/L	–	–	0.001	–	–	–	–	–	–
Toluene	mg/L	150	–	0.15	–	150	–	–	–	–
Ethylbenzene	mg/L	300	–	0.7	–	300	–	–	–	–
Total xylenes	mg/L	1750	–	1.75	–	1800	–	–	–	–
OTHER:										
MBAS (Surfactants)	mg/L	–	500	–	500	–	–	–	–	–
perchlorate	mg/L	6	–	–	–	1	0.006	0.006	–	–

Notes:
All concentrations in milligrams per liter (mg/L) or parts per million (ppm) except where noted.
Dash (–) indicates no current standard or no available information.
USEPA = U.S. Environmental Protection Agency.
California DHS = California Department of Health Services, now Department of Public Health
MBAS = Methylene Blue Active Substances.
NTU = Nephalometric Turbidity Units.
TON = Threshold Odor Number.
SU = Standard Units
* Optimal fluoride level and (range) vary with average of maximum daily temperature:
50.0 to 53.7 degrees F – 1.2 (1.1 to 1.7) mg/L; 53.8 to 58.3 degrees F – 1.1 (1.0 to 1.7) mg/L
58.4 to 63.8 degrees F – 1.0 (0.9 to 1.5) mg/L; 63.9 to 70.6 degrees F – 0.9 (0.8 to 1.4) mg/L
70.7 to 79.2 degrees F – 0.8 (0.7 to 1.3) mg/L; 79.3 to 90.5 deg

** Systems that use conventional or direct filtration may not exceed 1 NTU at any time or 0.3 NTU for 95th percentile value; systems that use other “alternative” filtration systems may not exceed 5 NTU at any time or 1 NTU for 95th percentile value.

† USEPA recommended agricultural limit for boron is 0.750 mg/L.
References:
Current USEPA and California DHS drinking water standards from California

Table C-8a. List of Regulated Facilities with Recent Water Quality Data

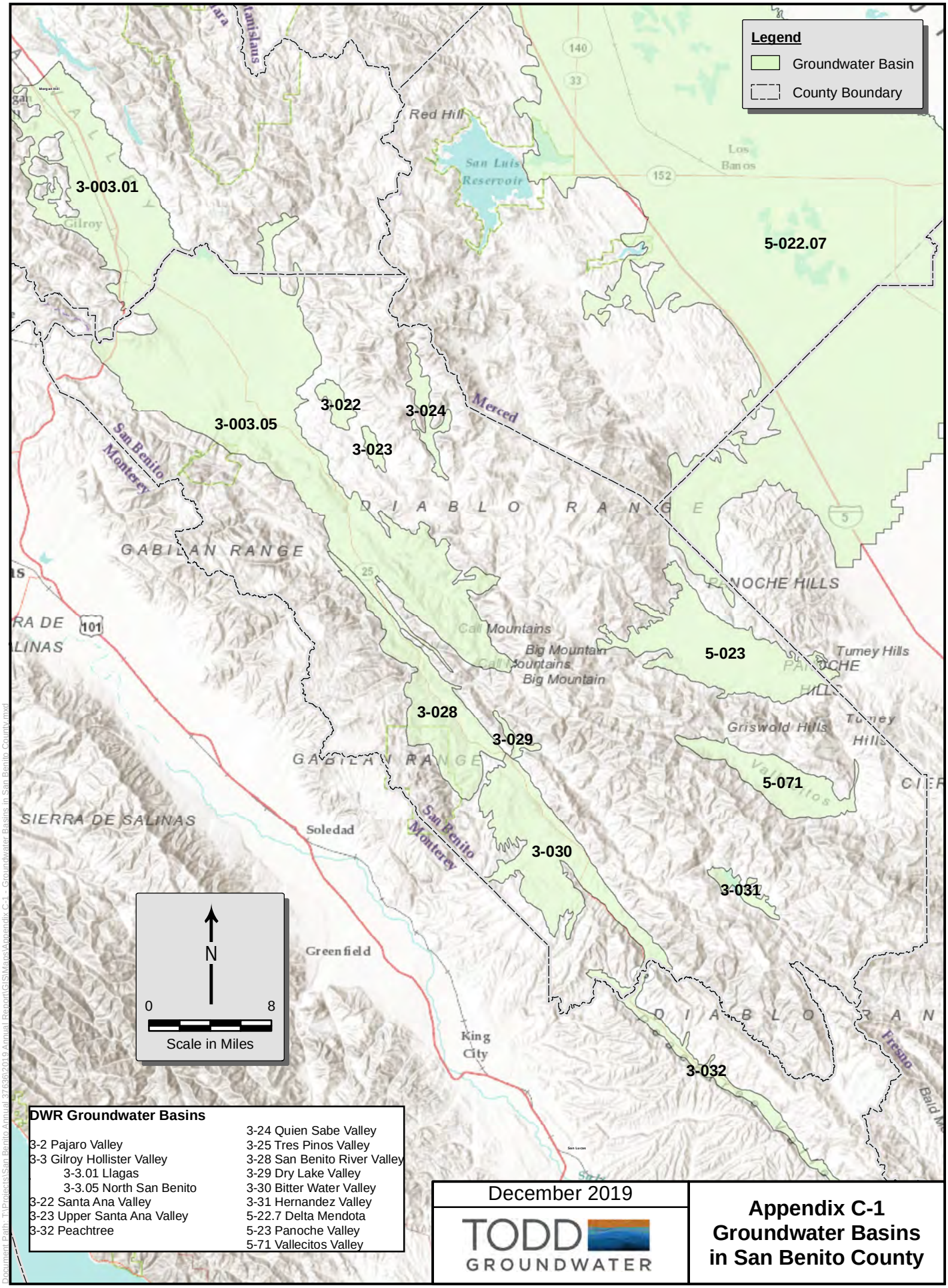
Name	Current or Former Operations	# of Wells	Potential Water Quality Problems	Order Number	Notes
Aromas-San Juan USD (Anzar High School)	High school with a wastewater treatment facility	3	salinity, nitrogen species	96-36	
BAE Systems (United Defense)	Ballistics Testing	64	perchlorate, nitrogen species	R3-2055-0113	
CEMEX Ready Mix Plant San Juan Bautista		2			
Chervon 9-1898	Gas station with a leaking underground storage tank	10			
Chevron 9-9156	Gas station with a leaking underground storage tank	1	BTEX	00-68	
Cielo Vista Estates	Housing development with a wastewater treatment facility	3	TDS, Na, Cl, Nitrogen		
Crop Production Services (Western Farm Service)	Fertilizer and Pesticide storage	6	pesticides, nitrogen species, salinity	01-052	
El Toro	Leaking underground storage tank	14	BTEX		
Hollister Domestic WWTP	for the City of Hollister	13	salinity, nitrogen species	87-47	
Hollister Industrial WWTP	Industrial wastewater treatment facility for the City of Hollister	7	salinity, nitrogen species	00-020	
John Smith Landfill	Waste disposal	19	organic, inorganic, metals	R3-2002-001	
McCormick Teledyne	Explosive products for the aerospace and automotive safety industries	38	perchlorate, nitrogen species, metals, salinity		
MK Ballistics (United Defense)	Ballistics Testing	9	perchlorate	CU-06-00123	
NH3 Service Company	Fertilizer and Pesticide storage	1	pesticides, nitrogen species, salinity		
PSEMC (former PacSci)		11			
Sambrailo Packaging		6	BTEX		
San Juan Bautista WWTP	Wastewater disposal	3	salinity, nitrogen species	R3-2003-0087	
Sunnyslope WWTP	Wastewater disposal	3	salinity, nitrogen species	R3-2004-0065	
Tres Pinos WWTP	Wastewater disposal	4	salinity, nitrogen species	99-101	
Whittaker Ordinance	Manufacturing	199	perchlorate	99-006	

Table C-8b. List of Regulated Facilities with Historical Water Quality Data

Name	Current or Former Operations	# of Wells	Potential Water Quality Problems	Order Number	Notes
Betabel Valley RV Resort	Recreational vehicle camp with a wastewater treatment facility	2	salinity, nitrogen species	88-23	No recent information
Biosystems Management	Biosolids waste disposal	4	salinity, nitrogen species, metals		closed
Blossom Hill Winery	Winery	6	hardenss, salinity		
Casa De Fruta	Fruit stand/tourist attraction with a wastewater treatment facility	5	salinity, nitrogen species		
Chevron 9-1898	Gas station with a leaking underground storage tank	9	BTEX, MTBE		closed
E Ranch Milk	Gas station with a leaking underground storage tank	23	BTEX and other organics, pH, EC	98-68	
El Modeno Gardens	Commercial nursery irrigation runoff	4	salinity, nitrogen species	99-050	
GAF Leatherback Industries Warehouse Facility	Former Saturator	4	VOCs, Petroleum products		Ceased Operations in 2007, RWQCB Site Opened April 2009
Gibson Farms Inc.	Fruit producer (processing wastes)	1	salinity, nitrogen species	R3-2004-0066	
Granite Rock Co	Sand and gravel quarry	6	turbidity	R3-2005-0063	
Laverone Property (BK Towing)	Leaking underground storage tank	14	BTEX	92-101	
Natural Food Selection/ Earthbound Farms	Fruit and Vegetable processing wastes	11	salinity, nitrogen species	R3-2004-006	
Nyland Ranch Warehouse	Leaking underground storage tank	4	salinity, boron		closed
PG &E / City of Hollister Fire Department	Leaking underground storage tank	4	BTEX		Closed 7/21/92
Rancho Justo Company	Golf course with domestic wastewater disposal system	3	salinity, nitrogen species		
San Juan Bautista City Yard	Underground storage tanks	6	BTEX		No recent information
San Juan Oaks Golf Club	Golf course with domestic wastewater disposal system	2	salinity, nitrogen species		
TOSCO Facility #3738		3	BTEX		Soil samples only
Victory Gas and Food	Gas station	13	BTEX		No recent information
Wilbur-Ellis	Agricultural products and chemicals marketer and distributor	3	salinity, nitrogen species		

Table C-9. Number of Wells with Contaminant Measurements in Each Management Area

Contaminant Name	Units	Southern	San Juan	Hollister	Bolsa
Sodium	MG/L	4	19	40	2
Chloride	MG/L	4	19	41	2
Fluoride	MG/L	0	13	12	2
Iron	UG/L	6	21	41	2
Manganese	UG/L	7	21	41	2
Nitrate (As No3)	MG/L	14	26	45	5
Nitrate + Nitrite (As N)	MG/L	0	12	18	2
Nitrite (As N)	MG/L	7	23	38	3
Color	UNITS	0	13	20	2
Odor Threshold @ 60 C	TON	0	12	17	2
Specific Conductance	US	6	20	40	2
Total Dissolved Solids	MG/L	4	20	40	2
Turbidity, Laboratory	NTU	0	13	21	2
Antimony	UG/L	4	20	37	2
Aluminum	UG/L	4	20	38	2
Arsenic	UG/L	4	20	38	2
Barium	UG/L	4	20	38	2
Boron	UG/L	0	6	24	2
Cadmium	UG/L	4	20	37	2
Chromium VI	UG/L	0	7	16	0
Chromium	UG/L	4	20	37	2
Copper	UG/L	3	18	38	2
Lead	UG/L	4	15	33	2
Mercury	UG/L	4	20	37	2
Nickel	UG/L	4	20	37	2
Selenium	UG/L	4	20	37	2
Silver	UG/L	3	15	29	2
Sulfate	MG/L	3	18	41	2
Thallium	UG/L	4	20	37	2
Uranium	UG/L	3	9	7	0
Zinc	UG/L	3	18	39	2
Total Trihalomethanes	UG/L	6	9	29	0
Perchlorate	UG/L	6	14	22	0



DWR Groundwater Basins

	3-24 Quien Sabe Valley
3-2 Pajaro Valley	3-25 Tres Pinos Valley
3-3 Gilroy Hollister Valley	3-28 San Benito River Valley
3-3.01 Llagas	3-29 Dry Lake Valley
3-3.05 North San Benito	3-30 Bitter Water Valley
3-22 Santa Ana Valley	3-31 Hernandez Valley
3-23 Upper Santa Ana Valley	5-22.7 Delta Mendota
3-32 Peachtree	5-23 Panoche Valley
	5-71 Vallecitos Valley

December 2019

TODD GROUNDWATER

Appendix C-1
Groundwater Basins in San Benito County

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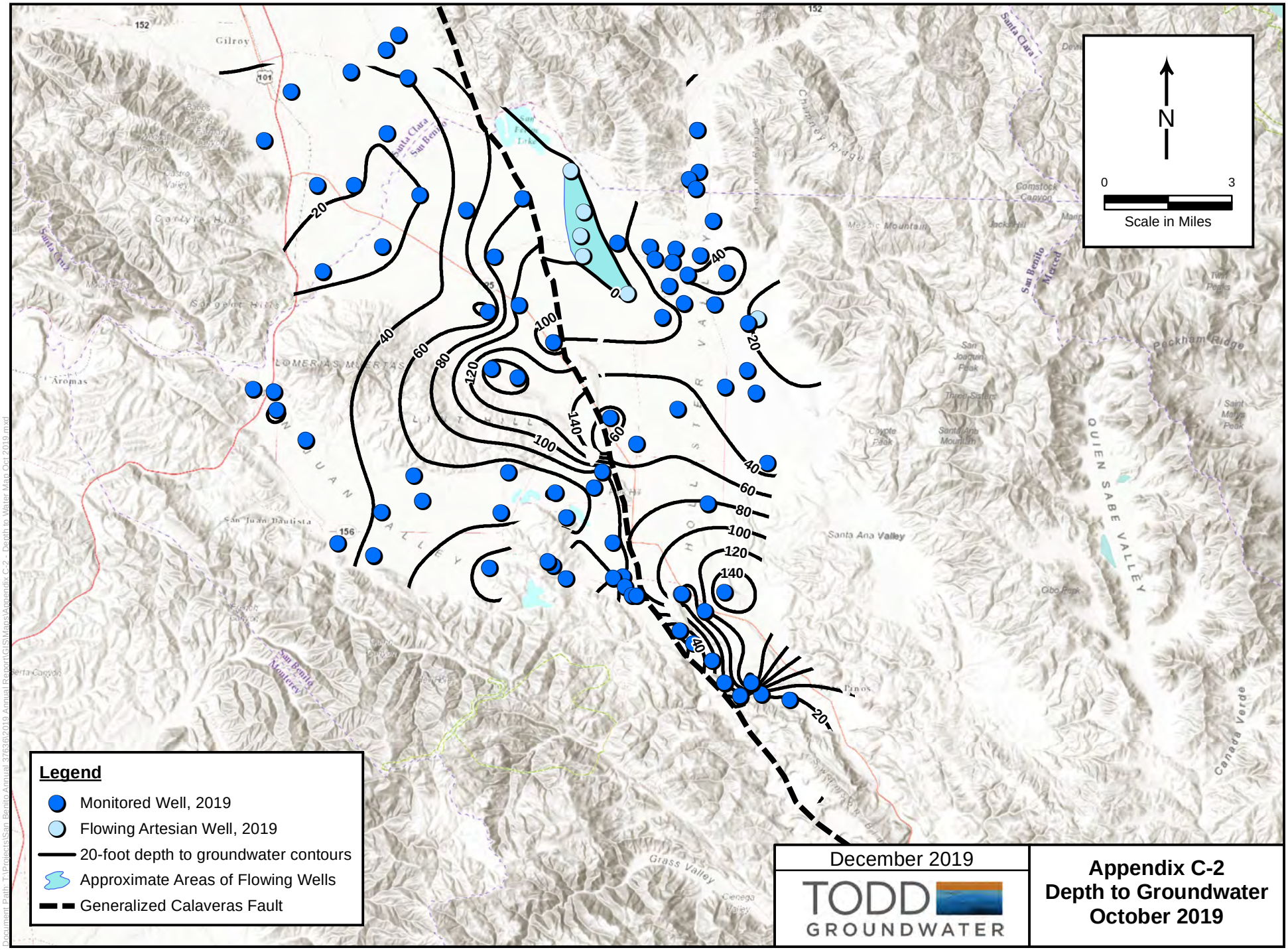
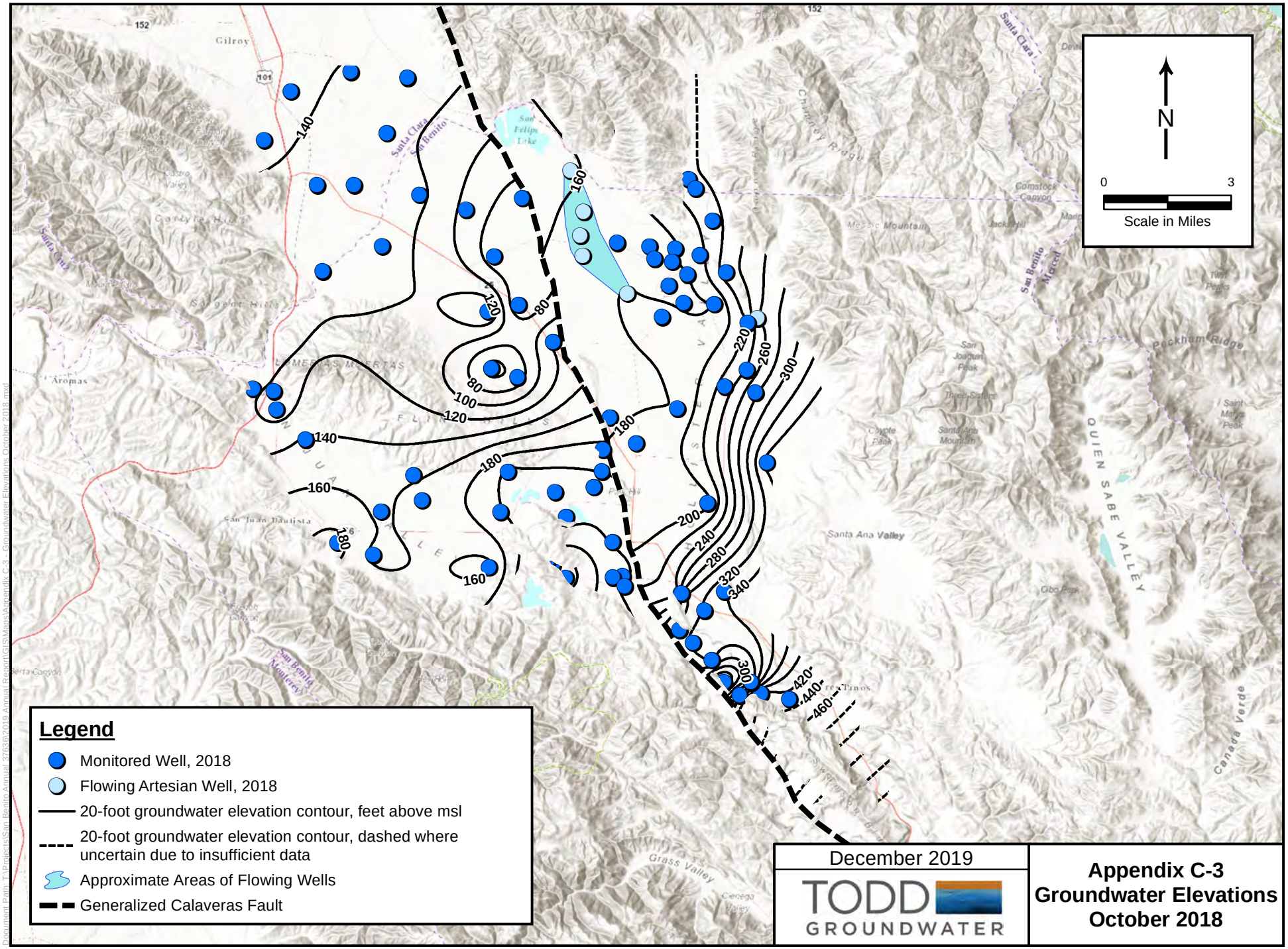


December 2019

TODD GROUNDWATER

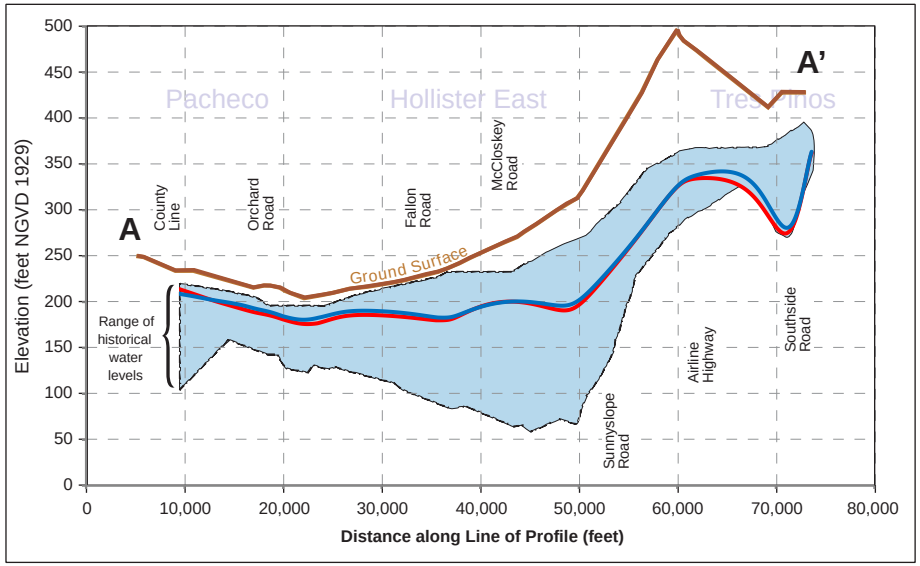
Appendix C-2
Depth to Groundwater
October 2019

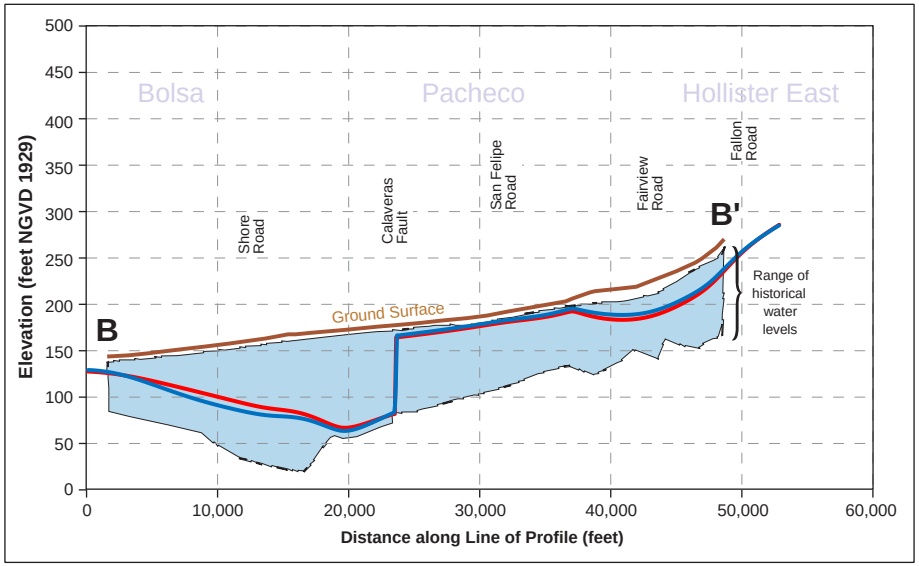


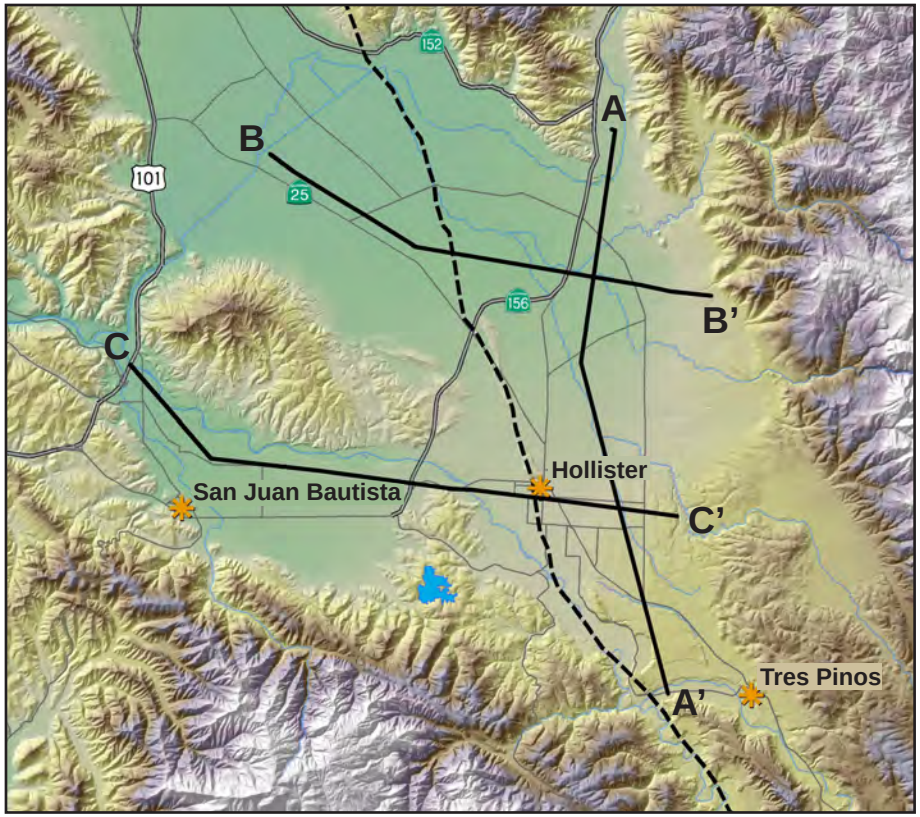
December 2019

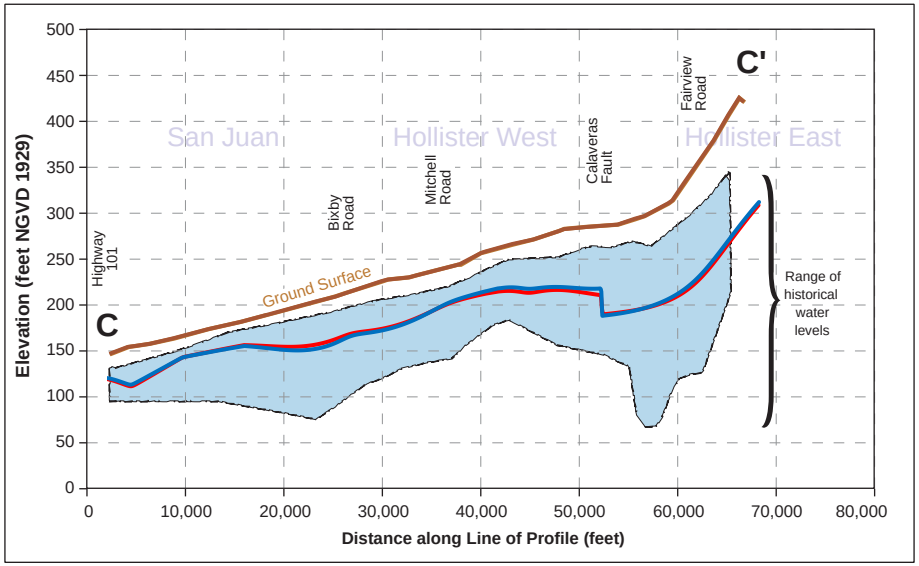
TODD GROUNDWATER

Appendix C-3
Groundwater Elevations
October 2018









Water Year 2018
Water Year 2019
Ground Surface
Range of Historical Water Levels

December 2019

TODD GROUNDWATER

Appendix C-4
Profiles of Historical Groundwater Levels

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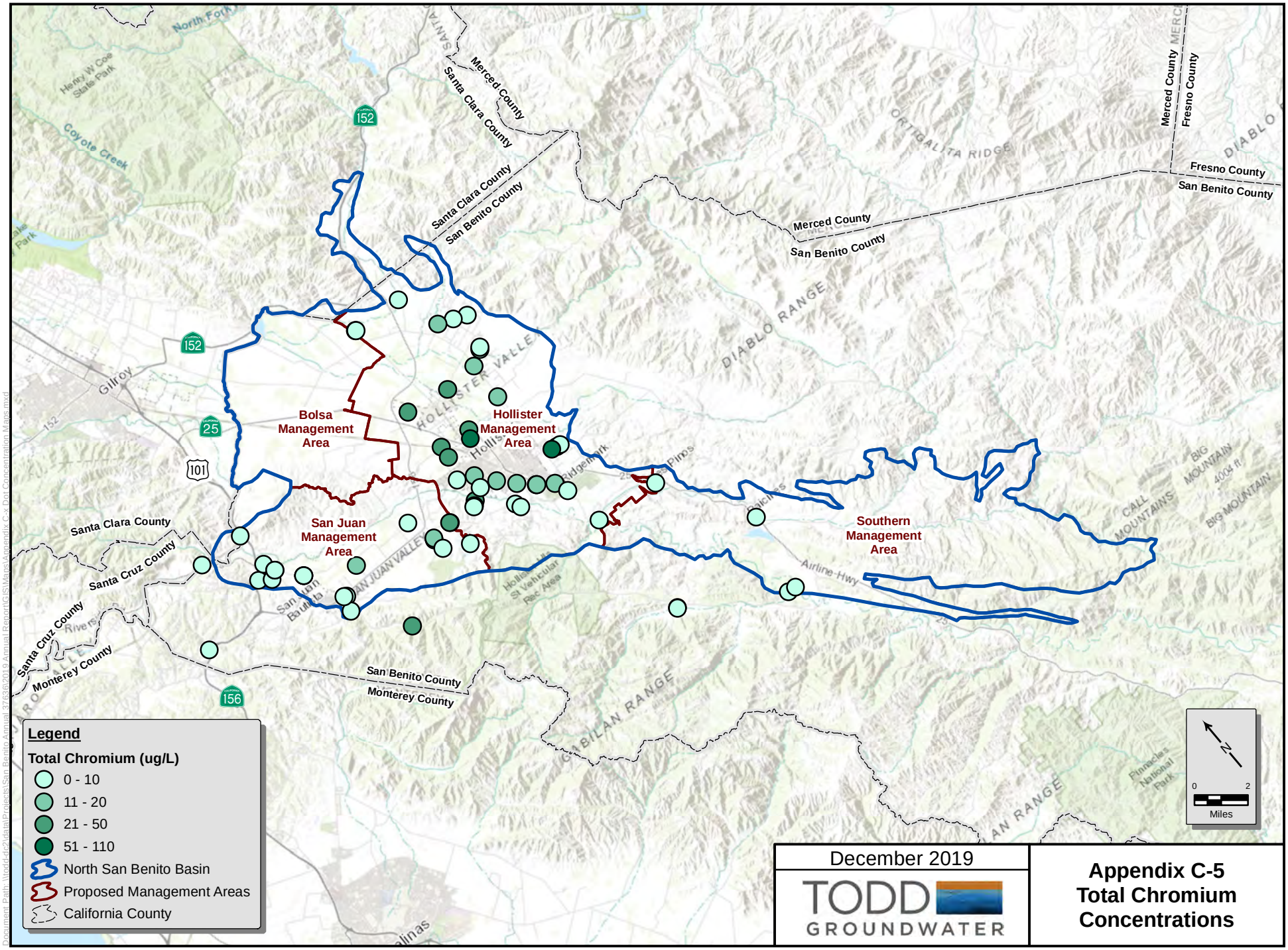
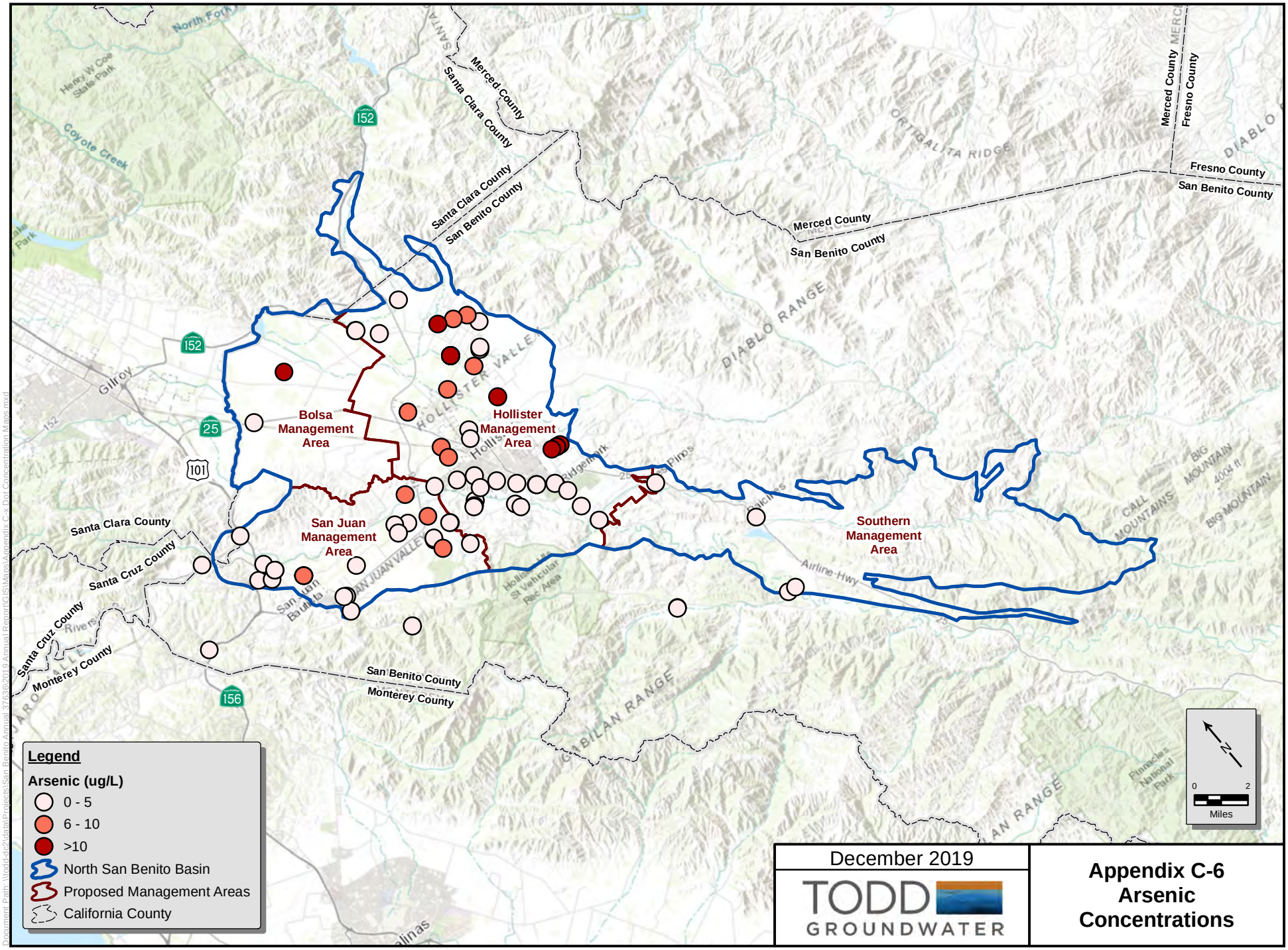


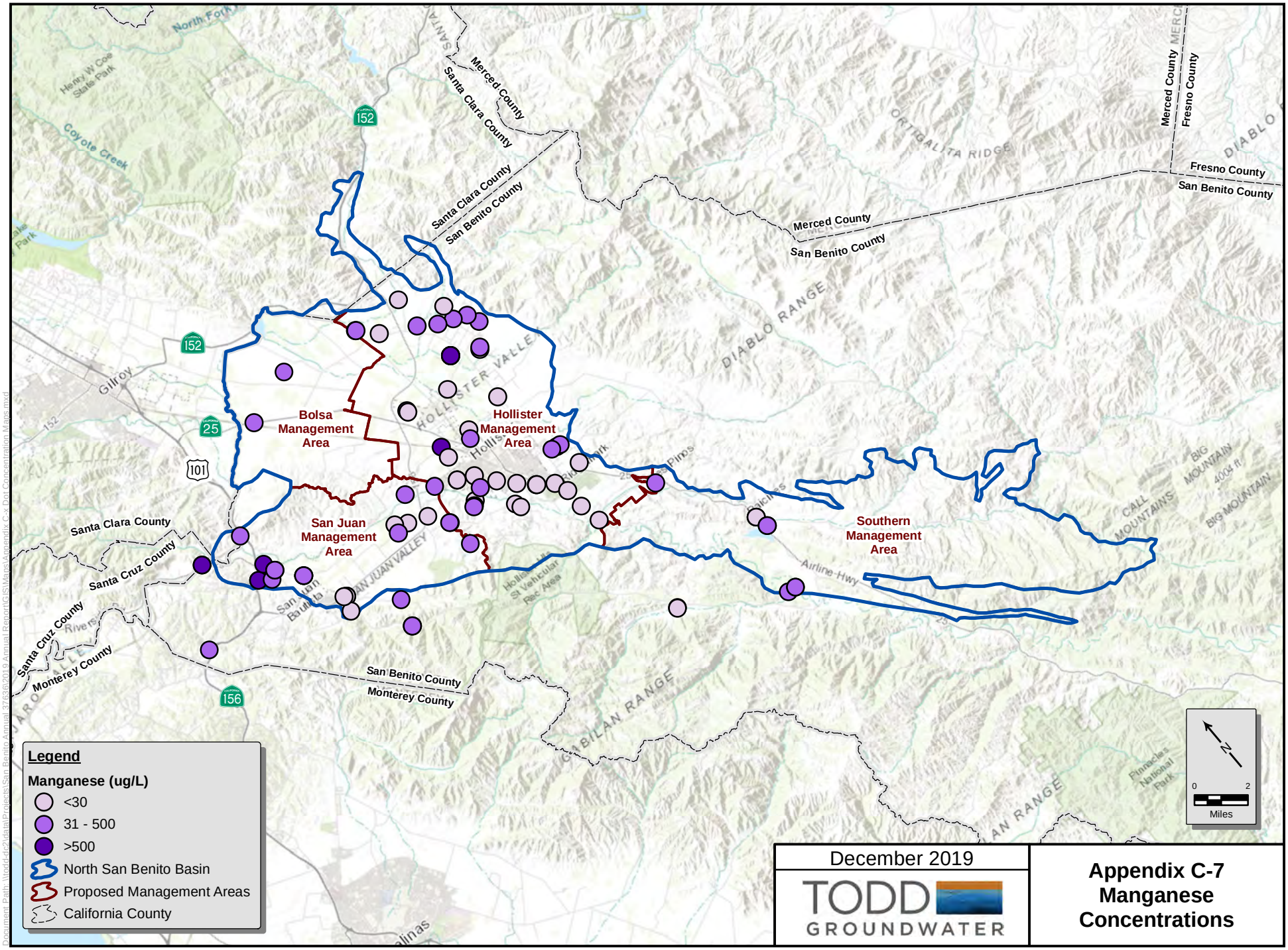
December 2019

TODD GROUNDWATER

Appendix C-5
Total Chromium Concentrations



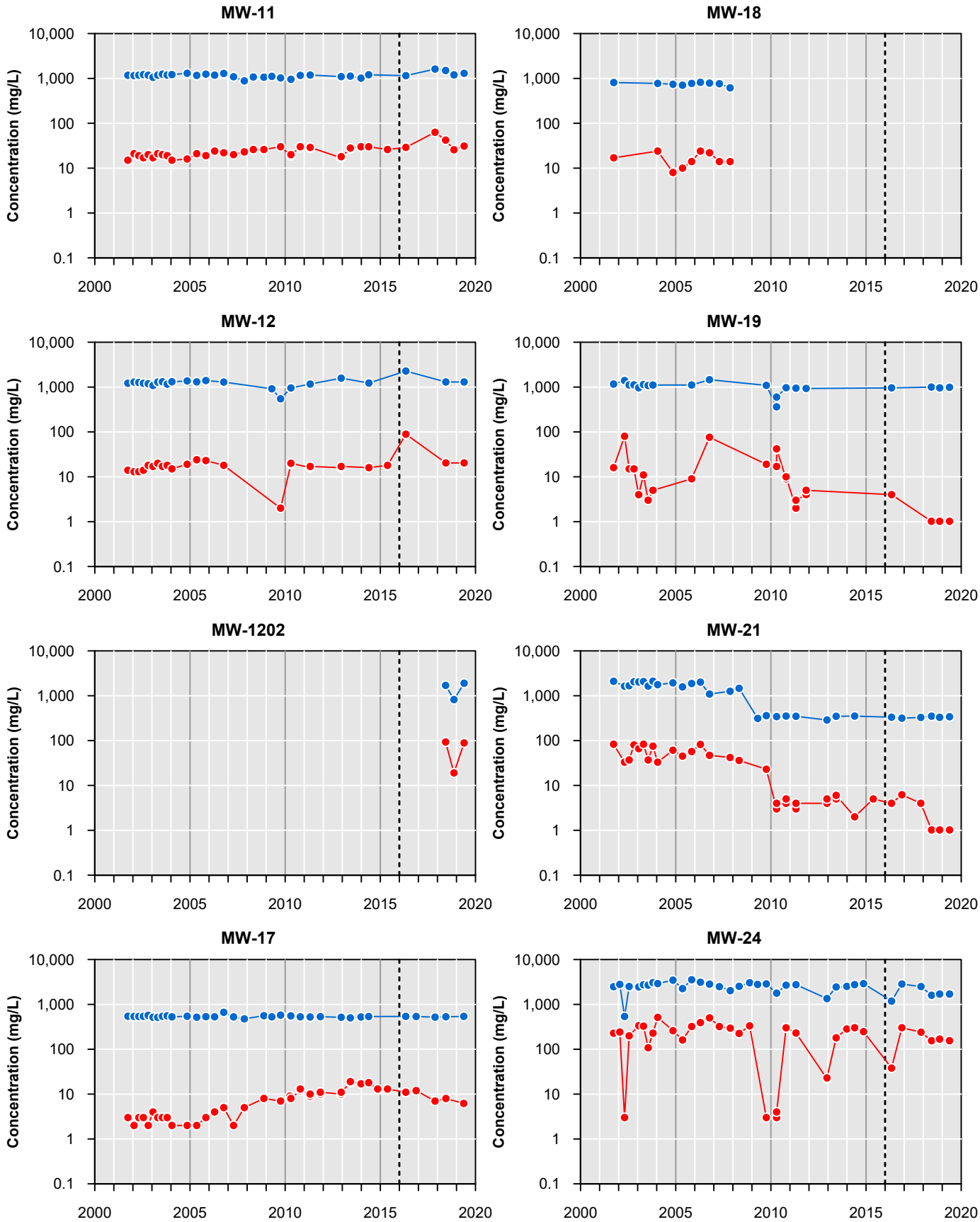
Appendix C-6
Arsenic Concentrations



December 2019

TODD GROUNDWATER

Appendix C-7
Manganese Concentrations

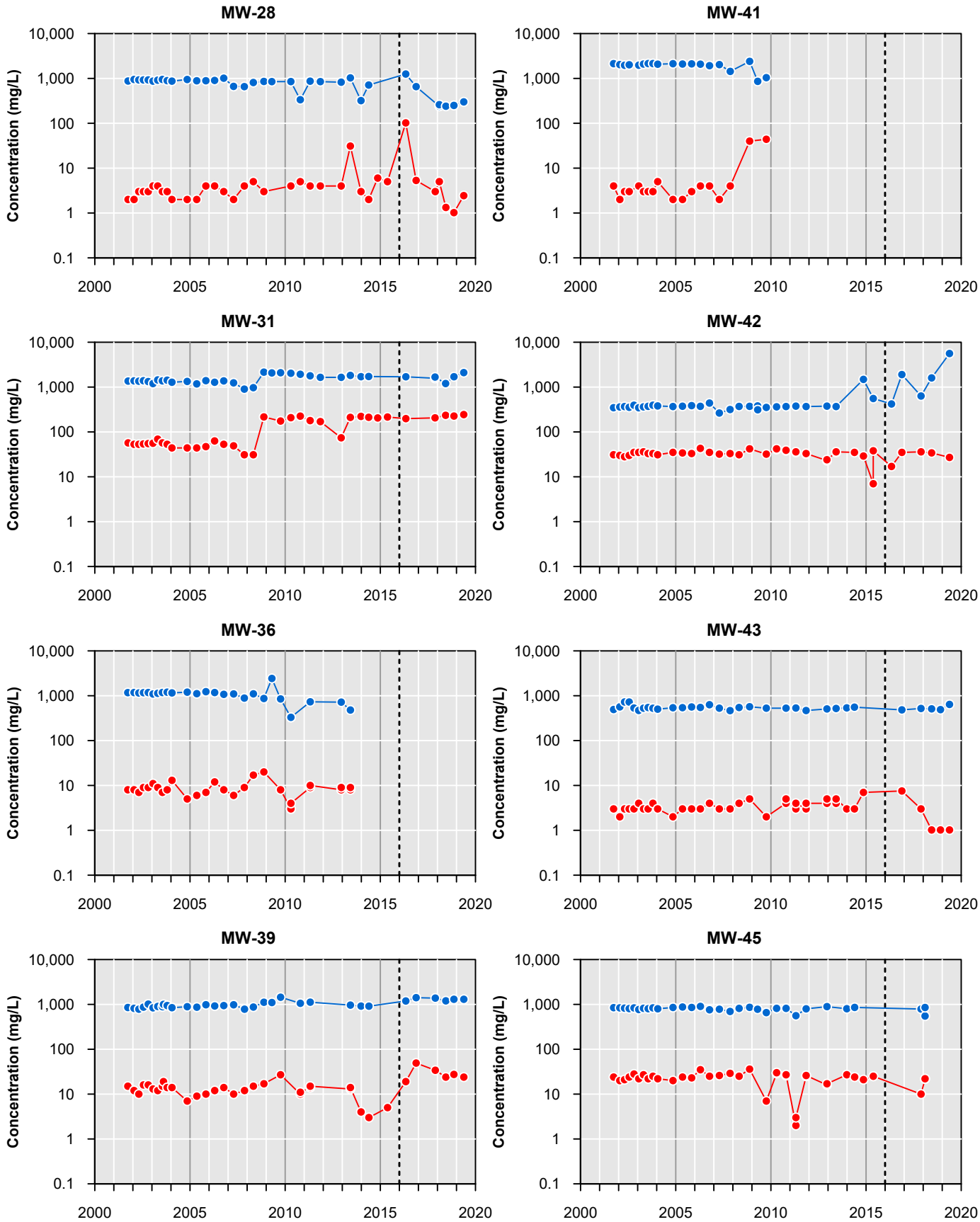


December 2019

TODD GROUNDWATER

Appendix C-8
NO3 and TDS
Concentration (mg/L)
Over Time
SBCWD Monitored Wells

Path: T:\Projects\San Benito Annual 37636\GRAPHICS\2019 Annual Groundwater Report\AppendixC-8_r2.gpj

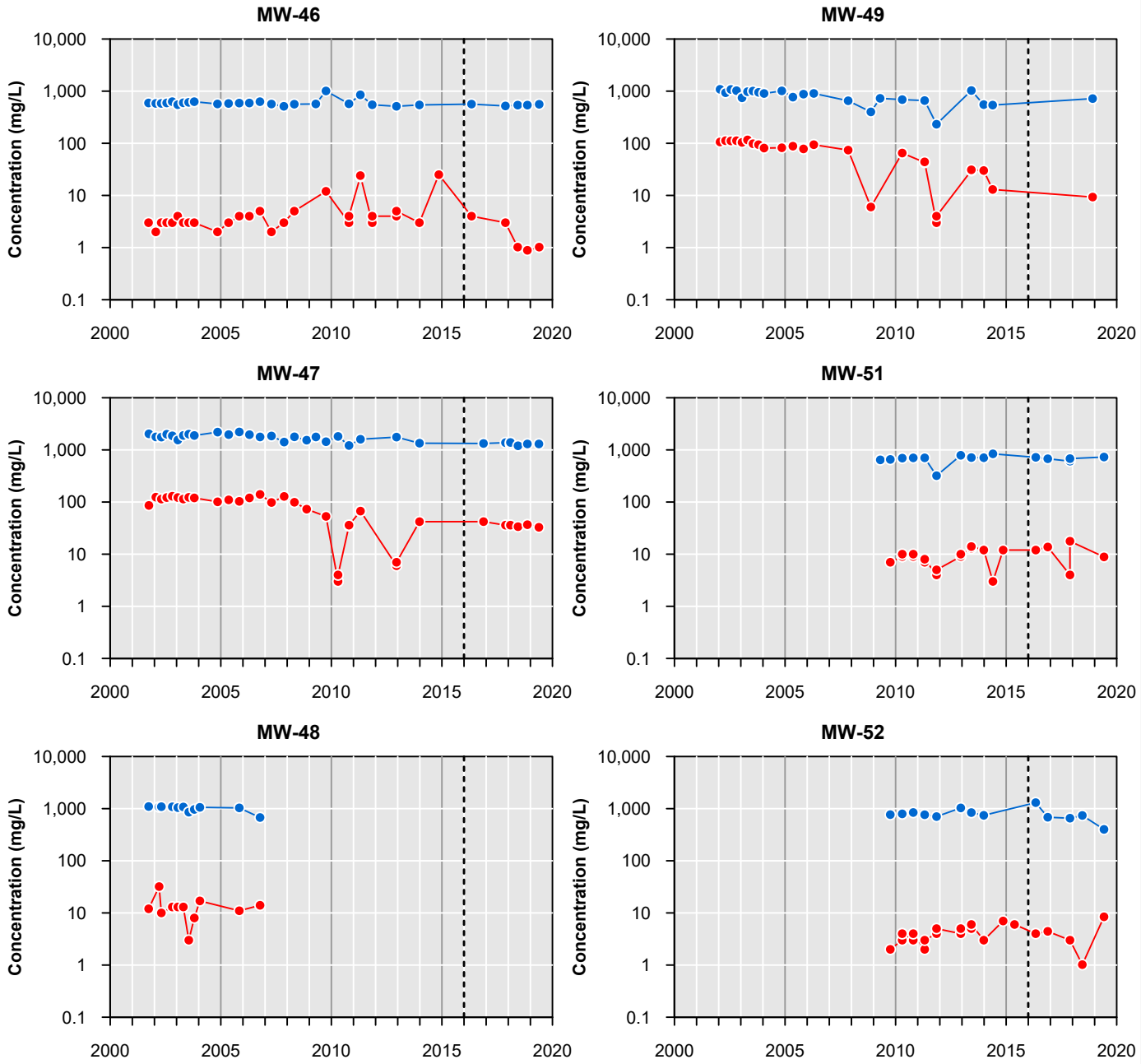


December 2019

TODD GROUNDWATER

Appendix C-9
NO3 and TDS Concentration (mg/L) Over Time
SBCWD Monitored Wells

Path: T:\Projects\San Benito Annual 37636\GRAPHICS\2019 Annual Groundwater Report\AppendixC-9_r2.gpj



Nitrate (NO3)

Total Dissolved Solids (TDS)

Beginning of study period (2016)

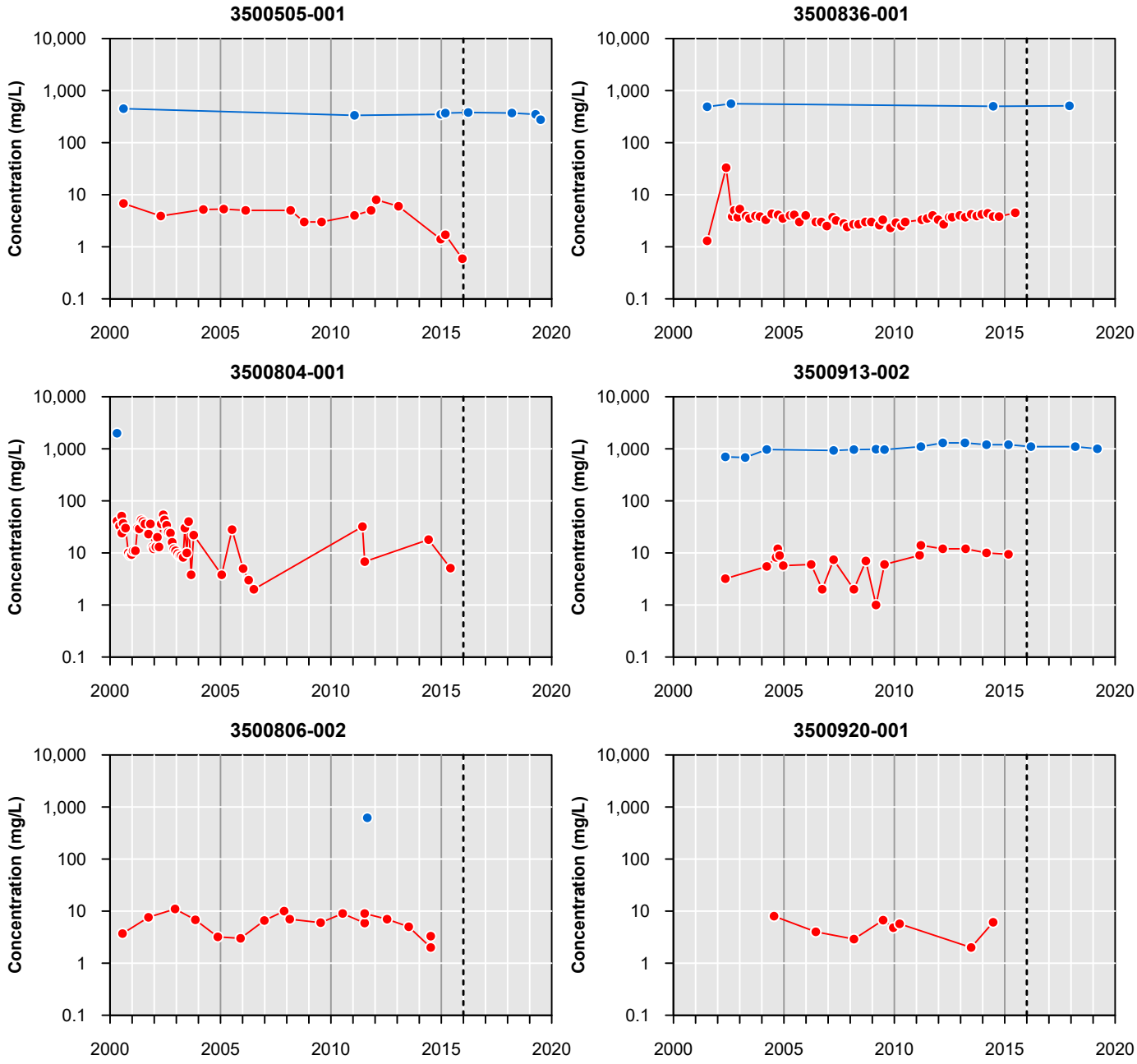
'MW-' = Monitored Well

December 2019

TODD GROUNDWATER

Appendix C-10
NO3 and TDS
Concentration (mg/L)
Over Time
SBCWD Monitored Wells

Path: T:\Projects\San Benito Annual 37636\GRAPHICS\2019 Annual Groundwater Report\AppendixC-10_r2.cpj



Nitrate (NO3)

Total Dissolved Solids (TDS)

Beginning of study period (2016)

December 2019

TODD GROUNDWATER

Appendix C-11
NO3 and TDS Concentration (mg/L) Over Time in Regulated Systems

Path: T:\Projects\San Benito Annual 37636\GRAPHICS\2019 Annual Groundwater Report\AppendixC-11_r2.gpj

APPENDIX D PERCOLATION DATA

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Figure D-1. Reservoir Releases for Percolation

Table D-1. Reservoir Water Budgets for Water Year 2019 (acre-feet)

	Hernandez	Paicines	San Justo	
Observed Storage				
Starting Storage (Oct 2018)	558	300	5,131	
Ending Storage (Sept 2019)	2,375	250	4,641	
Inflows				
Rainfall	430	106	204	
San Benito River	18,175	1,162	n.a.	
Hernandez-Paicines transfer	n.a.	2,670	n.a.	
San Felipe Project*	n.a.	n.a.	21,411	*
Total Inflows	**18,605**	**3,938**	**21,615**	
Outflows				
Hernandez spills	0	n.a.	n.a.	
Hernandez-Paicines transfer	2,670	n.a.	n.a.	
Tres Pinos Creek percolation releases	n.a.	2,045	n.a.	
San Benito River percolation releases	15,924	n.a.	n.a.	
CVP Deliveries*	n.a.	n.a.	21,501	*
Evaporation and seepage	906	2,898	1,197	
Total Outflows	**19,500**	**4,942**	**22,698**	
Change in Storage				
Observed storage change (Ending - Starting)	**1,817**	**-50**	**-490**	
Calculated net storage change (Inflow - Outflows)	**-896**	**-1,004**	**-1,083**	
Unaccounted for Water (Observed - Calculated)**	**2,712**	**954**	**593**	
Reservoir Information				
Reservoir capacity	17,200	2,870	11,000	
Maximum storage	12,572	2,580	10,308	
Minimum storage	558	250	4,573	

* Reflects imported water for beneficial use, not all stored in reservoir

** Negative value is water shortage, positive value is water surplus

Table D-2. Historical Reservoir Releases (AFY)

WY	Hernandez	Paicines	TOTAL
1996	13,535	6,139	19,674
1997	3,573	2,269	5,842
1998	26,302	450	26,752
1999	12,084	1,293	13,377
2000	13,246	2,326	15,572
2001	12,919	3,583	16,502
2002	9,698	310	10,008
2003	5,434	0	5,434
2004	3,336	0	3,336
2005	19,914	677	20,591
2006	14,112	196	14,308
2007	12,022	1,254	13,276
2008	7,646	495	8,141
2009	4,883	0	4,883
2010	8,484	4,147	12,631
2011	9,757	2,397	12,154
2012	6,341	1,321	7,662
2013	3,963	677	4,640
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	23,191	2,407	25,597
2018	6,054	384	6,438
2019	15,924	2,045	17,969
AVG	**9,684**	**1,349**	**11,033**

Table D-3. Historical Percolation of CVP Water (AFY)

Water Year[1]	Pacheco Creek	Arroyo de las Viboras			Arroyo Dos Picachos			Santa Ana Creek				Tres Pinos Creek (and Pond)	San Benito River (Union Road Pond)	Total
		Road	Creek 1 (Frog Ponds)	Creek 2	Fallon Road	Jarvis Lane	Creek	John Smith Road	Maranatha Road	Airline Highway	Ridgemark			
1994	232	136	515	0	0	550	209	0	0	0	0	85	158	1,885
1995	444	238	770	2	0	654	622	73	0	0	0	809	2,734	6,345
1996	0	494	989	832	67	235	708	531	197	134	25	21	6,097	10,330
1997	0	447	601	1,981	77	0	200	17	353	286	29	1,477	5,619	11,087
1998	0	132	109	403	0	0	0	65	0	158	74	518	1,084	2,543
1999	0	0	0	0	0	0	4	256	48	141	10	452	413	1,322
2000	1	0	0	6	0	0	3	236	21	240	12	285	938	1,740
2001	0	0	0	0	0	0	0	161	17	186	1	703	1,041	2,110
2002	0	0	0	2	0	0	1	78	2	143	0	426	470	1,122
2003	0	0	0	0	0	0	5	119	9	172	0	163	605	1,074
2004	0	0	0	0	0	0	52	83	0	0	0	1	882	1,018
2005	0	0	0	0	0	0	0	0	0	0	0	0	527	527
2006	0	0	0	0	0	0	7	156	0	0	0	1	451	614
2007	0	0	0	0	0	0	0	0	0	0	0	88	216	304
2008	0	0	0	0	0	0	0	0	0	0	0	0	6	6
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2,017	0	0	340	0	0	0	0	0	0	0	0	0	2,209	2,549
2,018	0	0	199	0	0	0	0	0	0	0	0	867	1,899	2,965
2,019	0	0	335	0	0	0	0	0	0	0	0	1,775	2,932	5,043

1. 2017-2019 percolation occurred only to recharge basins adjacent to the listed streams.

Table D-4. Percolation of Municipal Wastewater during Water Year 2019

	Pond Area[1] (acres)	Effluent Discharge (acre-feet)	Evaporation[2] (acre-feet)	Percolation (acre-feet)
Hollister - domestic	93	2,088	266	1,822
Hollister - industrial	39	0	0	0
Ridgemark Estates I & II	7	170	21	149
Tres Pinos	2	21	5	16
Total	141	2,279	292	1,986

Notes:

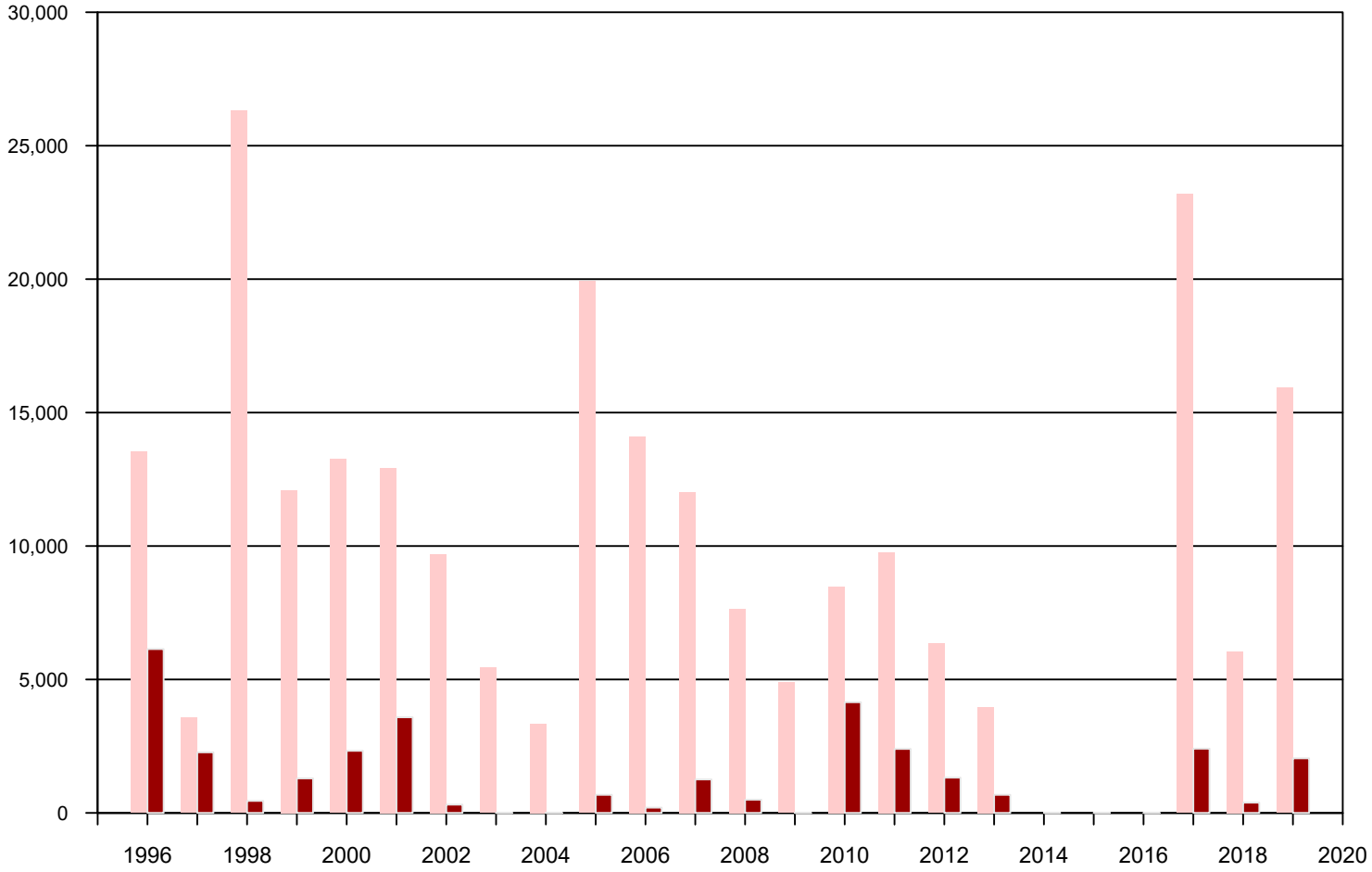
1. Hollister pond areas are from Dickson and Kenneth D. Schmidt and Associates (1999) and include treatment ponds in addition to percolation ponds at the domestic wastewater treatment plant. Assumes 80% of total pond area in use at any time (Rose, pers. comm.). These areas should be updated as operations change.

2. Average evaporation less precip = 43 inches (56 in/yr evaporation (DWR Bulletin 73-79) less 13 in/yr precip (CIMIS) The IWTP evaporation was adjusted to account only for when the ponds are in use.
The San Juan Bautista plant is not included because the unnamed tributary of San Juan Creek that receives its effluent usually gains flow along the affected reach and is on the southwest side of the San Andreas Fault. These conditions prevent the effluent from recharging the San Juan Subbasin.

Table D-5. Historical Percolation of Municipal Wastewater (AFY)

	Hollister Reclamation Plant - Domestic	Hollister - industrial wastewater and stormwater	Ridgemark Estates I & II	Tres Pinos	TOTAL
1994	1,775	665	155	5	2,600
1995	1,935	610	180	10	2,735
1996	2,020	689	207	14	2,930
1997	1,965	909	201	17	3,092
1998	2,490	518	231	17	3,256
1999	1,693	1,476	156	12	3,337
2000	2,110	1,136	293	24	3,563
2001	1,742	1,078	303	24	3,147
2002	1,884	1,545	283	24	3,736
2003	2,009	1,432	279	24	3,744
2004	1,787	1,536	268	21	3,612
2005	1,891	1,323	227	26	3,468
2006	1,797	1,211	216	33	3,257
2007	1,740	1,228	139	19	3,126
2008	1,580	1,257	139	19	2,996
2009	1,976	428	172	19	2,594
2010	1,922	37	172	19	2,150
2011	1,807	466	183	19	2,476
2012	1,740	605	177	19	2,541
2013*	889	332	188	21	1,430
2014	1,552	86	179	21	1,838
2015	1,816	344	161	21	2,342
2016	1,923	305	154	21	2,402
2017	1,945	57	154	20	2,177
2018	1,365	57	150	15	1,587
2019	1,822	0	149	16	1,986

*Potential missing data



Hernandez

Paicines

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Appendix D-1
Reservoir Releases for Percolation

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APPENDIX E WATER USE DATA FOR ZONE 6

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Table E-3. Recent Water Use by Subbasin and User Type (AFY)

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Table E-5. Municipal Water Use by Major Purveyor for Water Year 2018 (AF)

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Figure E-1. Total Water Use in Zone 6 by Water Source and User Category

Figure E-2. Water Use in Zone 6 by User Category

Figure E-3. Total Subbasin Water Use by Water Type Zone 6

Figure E-4. Portion of Ag and M&I Supply Satisfied by Groundwater Zone 6

Figure E-5. Relative Water Use by Supply Source Zone 6

Table E-1. Recent CVP Allocation and Use

Water Year	Municipal and Industrial (M&I) CVP				Agricultural CVP			
	Percent of Contract Allocation[1]	Percent of Historic Average[2]	Contract Amount Used (AF)	Contract Amount Used (%)	Percent of Contract Allocation[3]	Percent of Contract and M&I Adjustment[2]	Contract Amount Used (AF)[4]	Contract Amount Used (%)
	(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)		(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)	
2006	100%		3,152	38%	100%		19,840	56%
2007	100%		4,969	60%	40%		18,865	53%
2008	37%	75%	2,232	27%	40%	45%	10,514	30%
2009	29%	60%	1,978	24%	10%	11%	6,439	18%
2010	37%	75%	2,197	27%	45%	50%	10,061	28%
2011	100%		2,433	29%	80%		16,234	46%
2012	51%	75%	2,683	33%	40%	40%	17,267	49%
2013	47%	70%	2,652	32%	20%	22%	12,914	36%
2014	34%	50%	1,599	29%	0%	0%	7,545	21%
2015	25%		1,810	22%	0%		3,697	10%
2016	55%		1,914	23%	5%		4,434	12%
2017	100%		2,909	35%	100%		15,837	45%
2018	75%		5,679	69%	50%		17,418	49%
2019	100%		4,457	54%	75%		16,774	47%

Notes: 1 Total contract (100% allocation) M&I 8,250 AFY
2 Shortage Policy Adjustments
3 Total contract (100% allocation) Ag 35,550 AFY
4 Includes water percolated

Table E-2. Historical Water Use by Subbasin and Water Source (AFY)

Subbasin	Pacheco		Bolsa Southeast			San Juan		Hollister West			Hollister East			Tres Pinos		Total Zone 6		
Source	GW	CVP	GW	CVP	RW	GW	CVP	GW	CVP	RW	GW	CVP	RW	GW	CVP	GW	CVP	RW
1993	2,251	3,210	3,474	533		9,278	4,300	7,213	90		3,744	7,275		5,658	224	31,618	15,633	0
1994	3,748	3,394	3,467	602		10,859	3,836	7,327	87		5,475	6,808		5,294	263	36,169	14,990	0
1995	2,756	3,474	2,855	720		9,328	4,554	7,092	460		3,428	6,647		4,475	275	29,935	16,130	0
1996	2,533	3,500	2,682	782		8,726	5,187	5,717	679		3,396	8,267		3,695	408	26,748	18,823	0
1997	2,209	4,205	2,755	997		9,587	6,191	7,602	907		3,534	8,284		4,620	466	30,307	21,048	0
1998	2,035	2,165	1,561	361		6,963	4,099	4,991	591		4,037	5,291		3,751	289	23,338	12,796	0
1999	2,553	3,219	2,453	433		9,312	5,990	7,013	726		3,701	7,279		4,199	391	29,231	18,038	0
2000	2,270	3,256	2,418	355		8,681	6,372	7,590	869		3,108	7,279		4,006	542	28,073	18,673	0
2001	1,848	3,443	2,126	411		7,977	7,232	7,377	685		2,213	7,010		3,599	621	25,140	19,402	0
2002	2,322	3,840	2,193	497		7,571	7,242	6,577	706		2,588	7,390		3,994	737	25,244	20,411	0
2003	2,425	3,277	2,175	493		7,434	7,127	6,222	720		1,897	9,329		2,805	788	22,958	21,734	0
2004	2,461	3,607	2,405	740		8,121	7,357	4,971	614		2,321	10,726		3,204	966	23,484	24,010	0
2005	1,320	3,106	1,849	514		6,608	6,245	5,084	680		2,586	9,198		2,378	642	19,825	20,384	0
2006	1,208	3,495	1,864	661		6,741	7,200	4,633	579		2,555	10,253		2,537	803	19,538	22,992	0
2007	1,034	3,832	2,005	572		7,658	6,160	5,118	553		3,867	10,194		2,908	804	22,590	22,115	0
2008	1,900	1,568	2,014	333		7,796	3,160	4,375	399		3,962	6,792		2,743	493	22,789	12,745	0
2009	3,370	1,257	2,082	179		11,956	1,605	4,186	19		4,733	4,697		2,871	447	29,199	8,204	0
2010	2,553	1,771	1,897	207		9,561	3,452	4,081	10	151	4,460	6,056		1,686	488	24,238	11,984	151
2011	1,992	2,420	2,781	229		4,987	5,623	3,940	394	183	1,947	9,575		2,454	427	18,102	18,667	183
2012	3,723	2,652	1,556	288		5,782	5,976	4,298	549	230	2,004	9,917		2,492	568	19,855	19,949	230
2013	4,157	1,976	2,348	292		11,044	4,134	5,656	374	357	5,430	8,224		2,452	565	31,087	15,566	357
2014	3,303	1,020	2,157	32		10,018	1,984	7,227	233	262	4,872	5,490		3,014	384	30,592	9,144	262
2015	4,279	555	2,401	20		12,739	975	4,730	148	101	7,230	3,568		2,948	241	34,327	5,507	101
2016	4,386	420	2,558	30	38	13,581	819	4,031	162	253	6,383	4,810	207	2,223	106	33,162	6,347	499
2017	2,949	2,097	1,414	365	66	7,542	5,853	3,255	217	108	2,209	7,488	192	2,447	177	19,815	16,197	366
2018	4,375	1,529	3,063	291	3	8,932	6,383	3,922	2,054	468	3,699	9,686	0	1,865	188	25,856	20,131	471
20191	2,780	2,162	2,568	318	2	6,648	3,990	2,093	273	567	2,802	0	0	1,193	184	18,083	16,188	569
AVG 93-19	2,694	2,609	2,338	417	27	8,720	4,928	5,419	510	268	3,636	7,316	100	3,167	462	25,974	16,586	118

GW = groundwater, CVP = Central Valley Project, RW = recycled water

1. Hollister East includes 2,524 AF of CVP water delivered to the West Hills Treatment Plant in San Juan but supplied to Hollister East customers.

Table E-3a. Recent Water Use by Subbasin and User Type, Includes Recycled Water (AFY) - Agriculture

Management Area	Subbasin	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
								Agriculture								
Hollister	Bolsa SE	2,352	2,517	2,570	2,334	2,252	2,103	3,004	1,837	2,635	2,180	2,417	2,601	1,831	3,315	2,889
	Hollister East	8,543	9,526	10,685	8,012	6,860	8,315	9,067	9,453	10,832	8,151	8,464	8,784	7,756	9,594	7,673
	Hollister West	2,128	1,936	2,145	1,509	1,708	1,888	2,190	2,228	3,324	2,584	2,750	2,192	1,338	2,337	1,807
	Pacheco	4,190	4,469	4,573	3,220	4,304	4,242	4,279	6,148	5,990	4,121	4,658	4,616	4,964	5,663	4,838
	Tres Pinos	800	1,004	954	655	670	640	471	641	652	514	1,513	572	468	448	276
San Juan	San Juan	11,496	12,622	12,185	9,581	12,397	11,960	10,009	10,964	14,376	11,183	13,123	13,826	11,916	14,568	10,134
	TOTAL	**29,509**	**32,074**	**33,112**	**25,310**	**28,192**	**29,148**	**29,020**	**30,980**	**37,810**	**28,734**	**32,926**	**32,591**	**28,273**	**35,925**	**27,616**

Table E-3b. Recent Water Use by Subbasin and User Type, Includes Recycled Water (AFY) - M&I

Management Area	Subbasin	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
								M&I								
Hollister	Bolsa SE	12	8	7	13	9	0	6	6	4	9	5	25	14	43	0
	Hollister East[1]	3,241	3,280	3,203	2,742	2,570	2,307	2,594	2,608	2,961	2,277	2,334	2,617	2,132	3,790	4,389
	Hollister West	3,636	3,168	3,361	3,265	2,710	2,555	2,235	2,710	2,796	5,072	2,229	2,254	2,242	4,106	1,126
	Pacheco	235	234	293	248	323	83	133	227	144	203	176	191	81	241	104
	Tres Pinos	2,220	2,336	2,748	2,581	2,648	1,534	2,410	2,710	2,365	2,884	1,676	1,757	2,156	1,606	1,101
San Juan	San Juan	1,356	1,320	1,640	1,375	1,164	1,053	601	793	803	820	590	574	1,479	747	504
	TOTAL	**10,700**	**10,345**	**11,252**	**10,225**	**9,424**	**7,532**	**7,979**	**9,055**	**9,073**	**11,263**	**7,010**	**7,417**	**8,105**	**10,533**	**7,225**

1. Hollister East includes 2,524 AF of CVP water delivered to the West Hills Treatment Plant in San Juan but supplied to Hollister East customers.

Table E-4. Historical Water Use by User Type in Zone 6 - Includes Recycled Water (AFY)

WY	Agricultural	Municipal, and Industrial	Total	% Ag
1988	46,366	5,152	51,518	90%
1989	32,387	6,047	38,434	84%
1990	49,663	5,725	55,388	90%
1991	46,640	7,631	54,271	86%
1992	32,210	6,912	39,122	82%
1993	38,878	5,066	43,944	88%
1994	41,854	7,186	49,040	85%
1995	36,399	8,272	44,671	81%
1996	39,845	8,131	47,976	83%
1997	41,482	11,068	52,550	79%
1998	27,526	8,605	36,131	76%
1999	37,203	10,066	47,269	79%
2000	36,062	10,764	46,826	77%
2001	34,035	10,640	44,675	76%
2002	34,354	11,300	45,654	75%
2003	33,533	11,159	44,692	75%
2004	35,597	11,898	47,495	75%
2005	29,510	10,699	40,209	73%
2006	32,074	10,456	42,530	75%
2007	33,112	13,311	46,424	71%
2008	25,310	10,225	35,535	71%
2009	28,192	9,424	37,616	75%
2010	29,148	7,531	36,679	79%
2011	29,020	7,932	36,952	79%
2012	30,980	9,055	40,095	77%
2013	37,810	9,073	46,653	81%
2014	28,734	11,226	39,960	72%
2015	32,926	7,161	39,935	82%
2016	32,591	7,417	40,008	81%
2017	28,273	8,105	36,012	79%
2018	35,925	10,533	46,458	77%
2019	27,616	7,225	34,841	79%
AVERAGE	34,539	8,906	43,424	79%

Table E-5. Municipal Water Use by Major Purveyor for Water Year 2019 (AF)

	WY 2019	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Groundwater													
Sunnyslope CWD	**565**	72	44	27	18	22	12	20	64	60	72	71	84
City of Hollister	**588**	32	25	14	19	10	20	54	29	89	96	105	97
City of Hollister - Cienega Wells	**283**	10	3	8	9	8	10	9	54	78	78	8	8
San Juan Bautista	**257**	17	16	20	25	10	9	17	36	17	21	46	23
Tres Pinos CWD	**33**	3	3	2	2	1	2	2	3	4	4	4	4
Groundwater Subtotal	**1,728**	**133**	**90**	**71**	**73**	**51**	**53**	**102**	**186**	**247**	**271**	**235**	**215**
CVP Imported Water													
Lessalt Treatment Plant	**1,660**	160	173	130	95	70	91	114	134	166	173	158	194
West Hills Treatment Plant	**2,524**	209	214	190	195	150	177	180	249	197	277	258	229
Imported Water Subtotal	**4,184**	**369**	**387**	**320**	**290**	**221**	**269**	**293**	**383**	**363**	**449**	**416**	**423**
Municipal Total													
TOTAL Municipal Water Supply	**5,912**	**502**	**477**	**391**	**363**	**272**	**322**	**396**	**569**	**610**	**720**	**651**	**638**

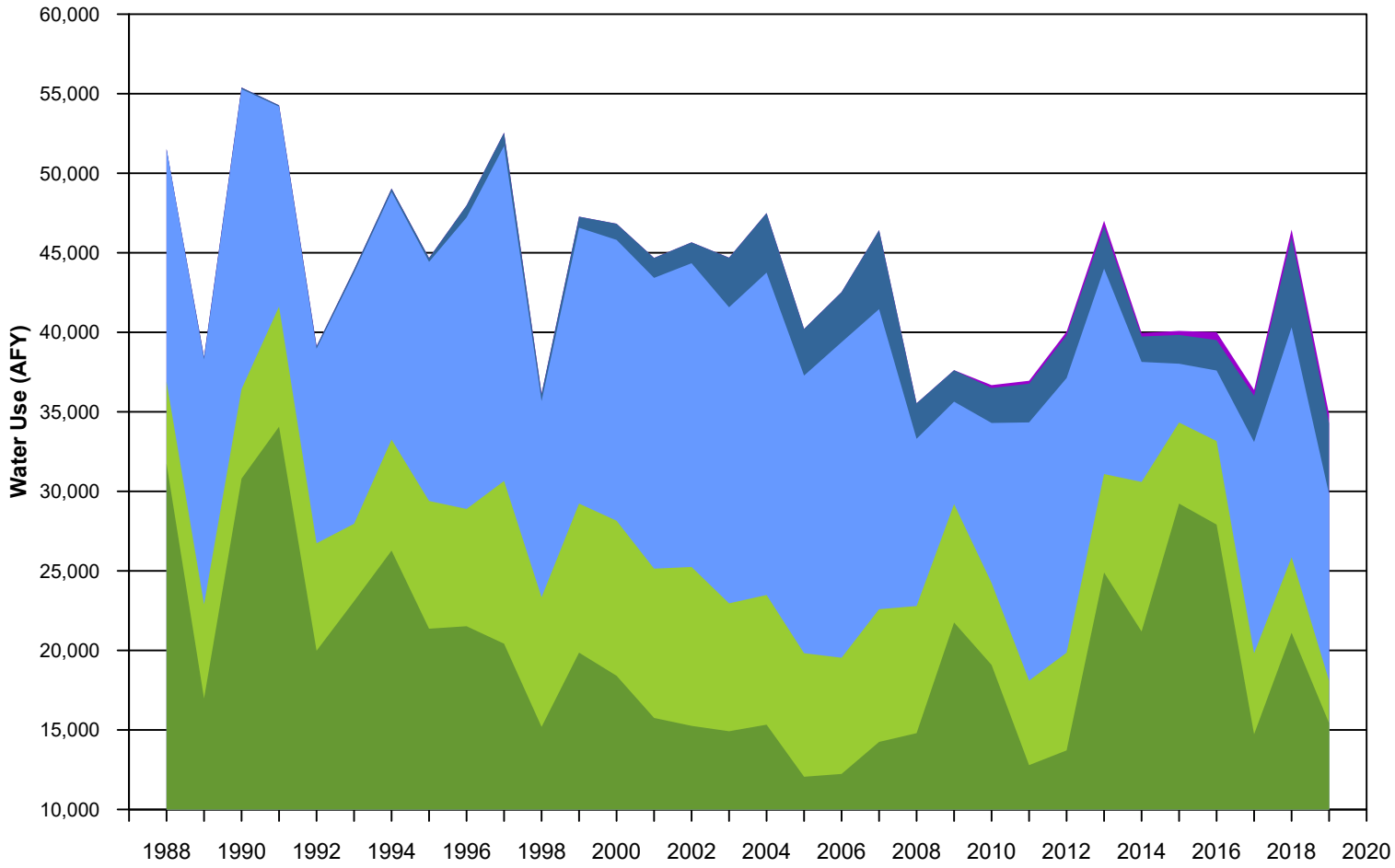
Table E-6. Historical Municipal Water Use by Major Purveyor (AFY)

WY	Sunnyslope CWD - GW	City of Hollister - GW	City of Hollister - Cienega Wells[1]	San Juan Bautista	Tres Pinos CWD	Lessalt Treatment Plant	West Hills Treatment Plant	Undivided Total	TOTAL
1988						0		5,152	5,152
1989						0		6,047	6,047
1990						0		5,725	5,725
1991						0		7,631	7,631
1992						0		6,912	6,912
1993						0		5,066	5,066
1994						0		7,186	7,186
1995	2,167	2,446				0			4,613
1996	2,139	3,386				0			5,525
1997	2,638	3,848				0			6,486
1998	2,357	3,441				0			5,798
1999	2,820	3,558				0			6,378
2000	3,214	4,021				0			7,235
2001	3,290	3,851				0			7,141
2002	3,256	4,120				21			7,398
2003	2,053	2,754				2,494			7,302
2004	2,426	2,828				2,101			7,356
2005	1,959	3,147	123	247	49	1,843			7,368
2006	1,907	2,801	123	150	49	1,900			6,930
2007	2,413	2,758	123	47	49	1,719			7,108
2008	2,294	2,746	123	417	47	1,323			6,949
2009	2,251	2,503	123	373	47	1,212			6,509
2010	1,861	2,194	108	308	47	1,344			5,861
2011	2,225	1,651	80	292	47	1,593			5,887
2012	2,360	1,761	130	267	45	1,657			6,219
2013	1,655	2,655	120	281	46	1,648			6,405
2014	2,134	2,646	114	285	49	979			6,207
2015	1,348	1,960	114	225	49	1,364			5,060
2016	1,331	1,615	105	232	49	1,682			5,014
2017	1,449	1,543	79	249	32	1,940	51		5,344
2018	978	1,217	121	184	34	1,596	1,990		6,119
2019	565	588	283	257	33	1,660	2,524		5,912

1. Data from Hollister Cienega Wells for 2005-2008 was estimated to be the same as WY 2009

Cells with no data indicate that the information is unavailable, while years with no use are shown explicitly as 0's.

Todd Groundwater 12/9/2019



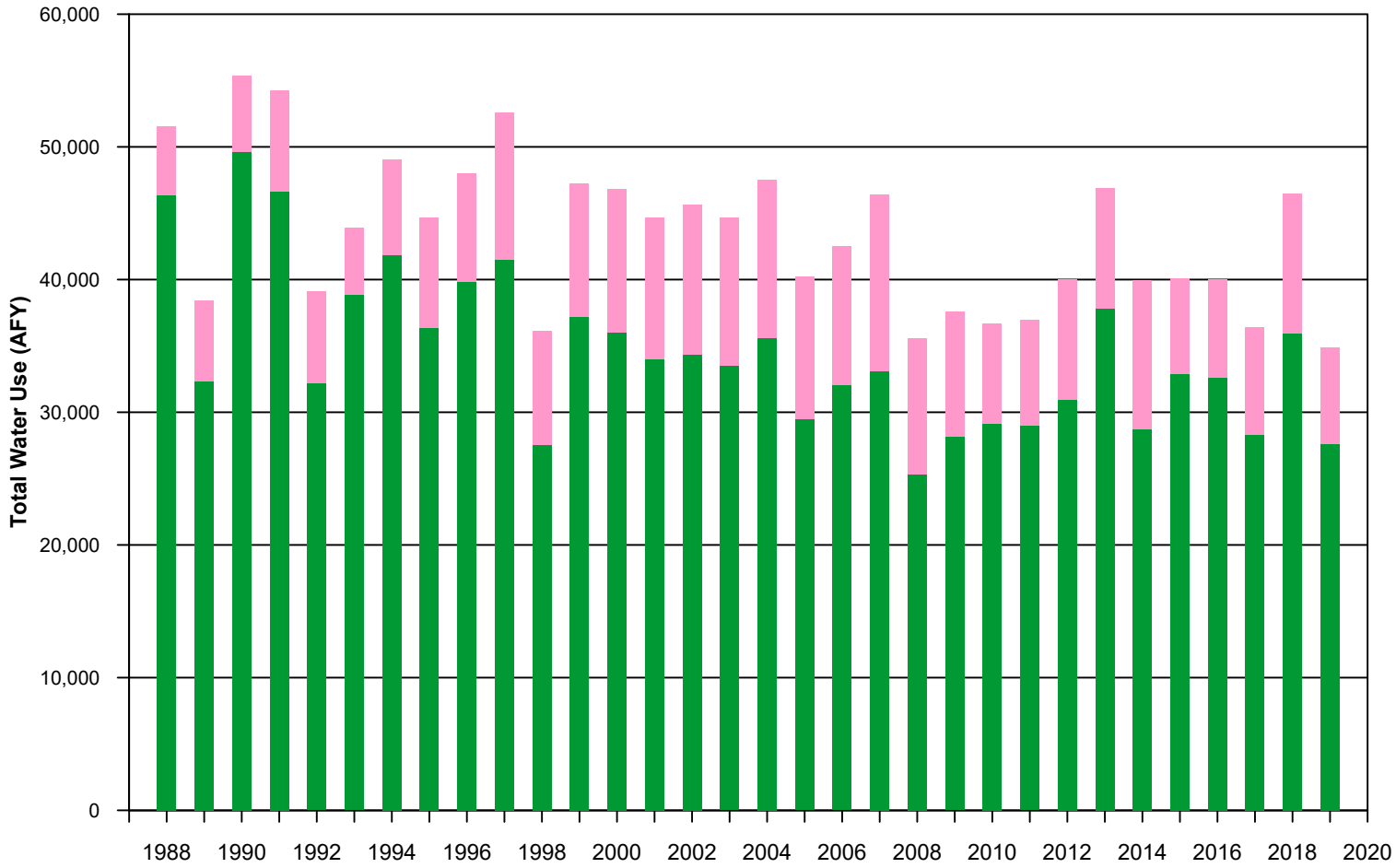
Recycled Water
CVP Domestic & Municipal
CVP Agriculture
Groundwater Domestic & Municipal
Groundwater Agriculture

December 2019

TODD GROUNDWATER

Appendix E-1
Total Water Use in Zone 6 by Water Source and User Category

Path: T:\Projects\San Benito Annual 37636\GRAPHICS\2019 Annual Groundwater Report\AppendixE-1.gpj



M&I

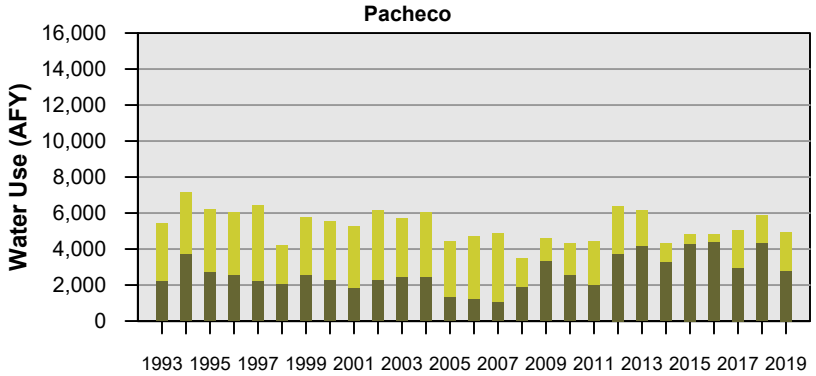
Ag

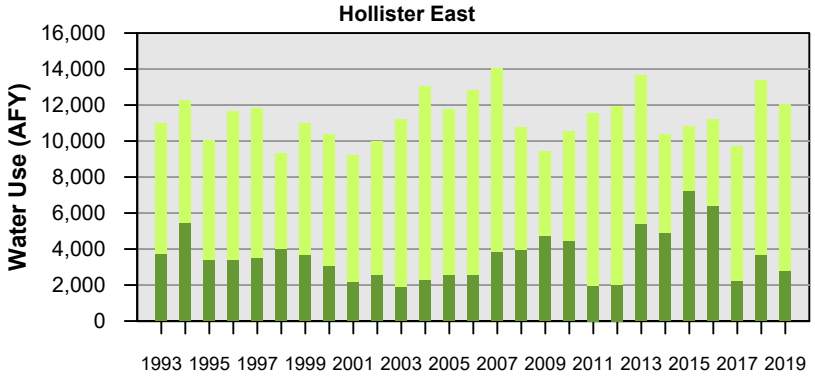
December 2019

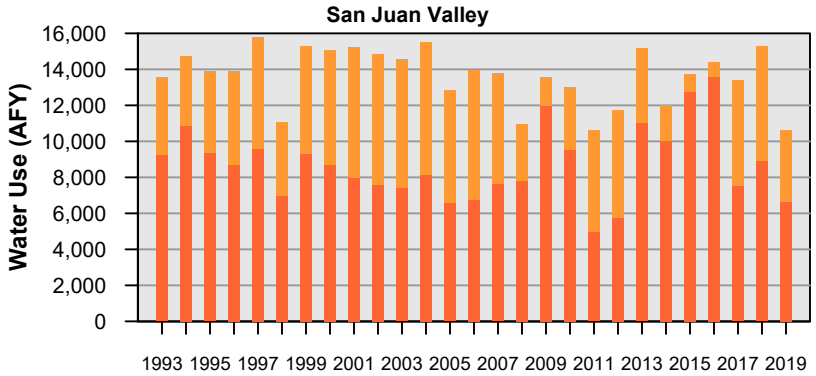
TODD GROUNDWATER

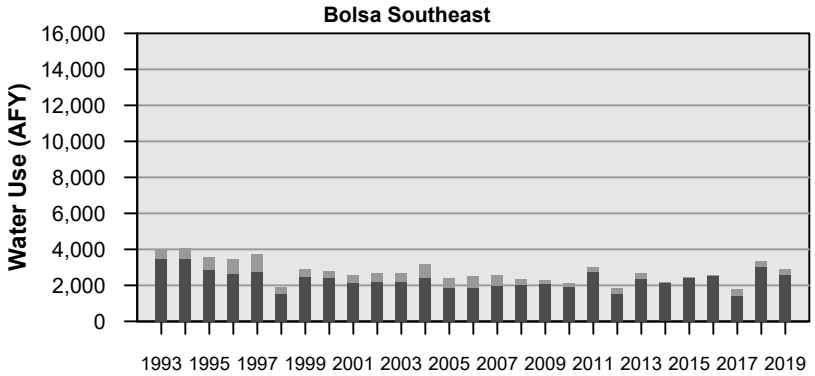
Appendix E-2
Water Use in Zone 6
by User Category

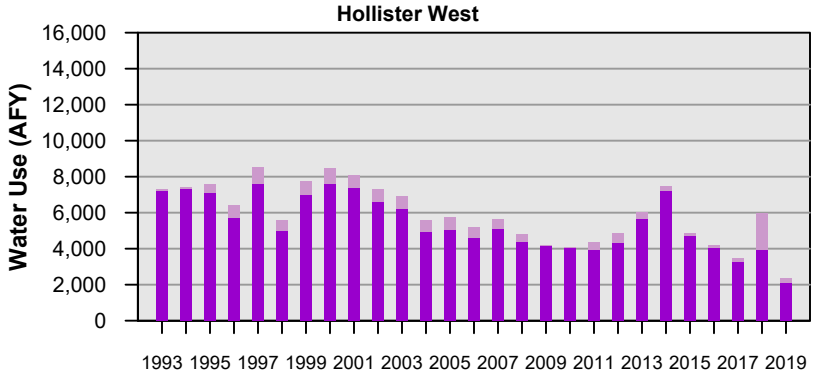
Path: T:\Projects\San Benito Annual 37636\GRAPHICS\2019 Annual Groundwater Report\AppendixE-2.gpj

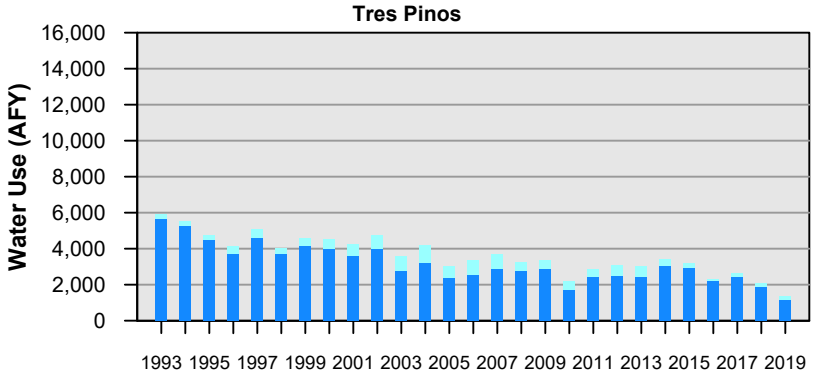












CVP water (lighter shade typ.)

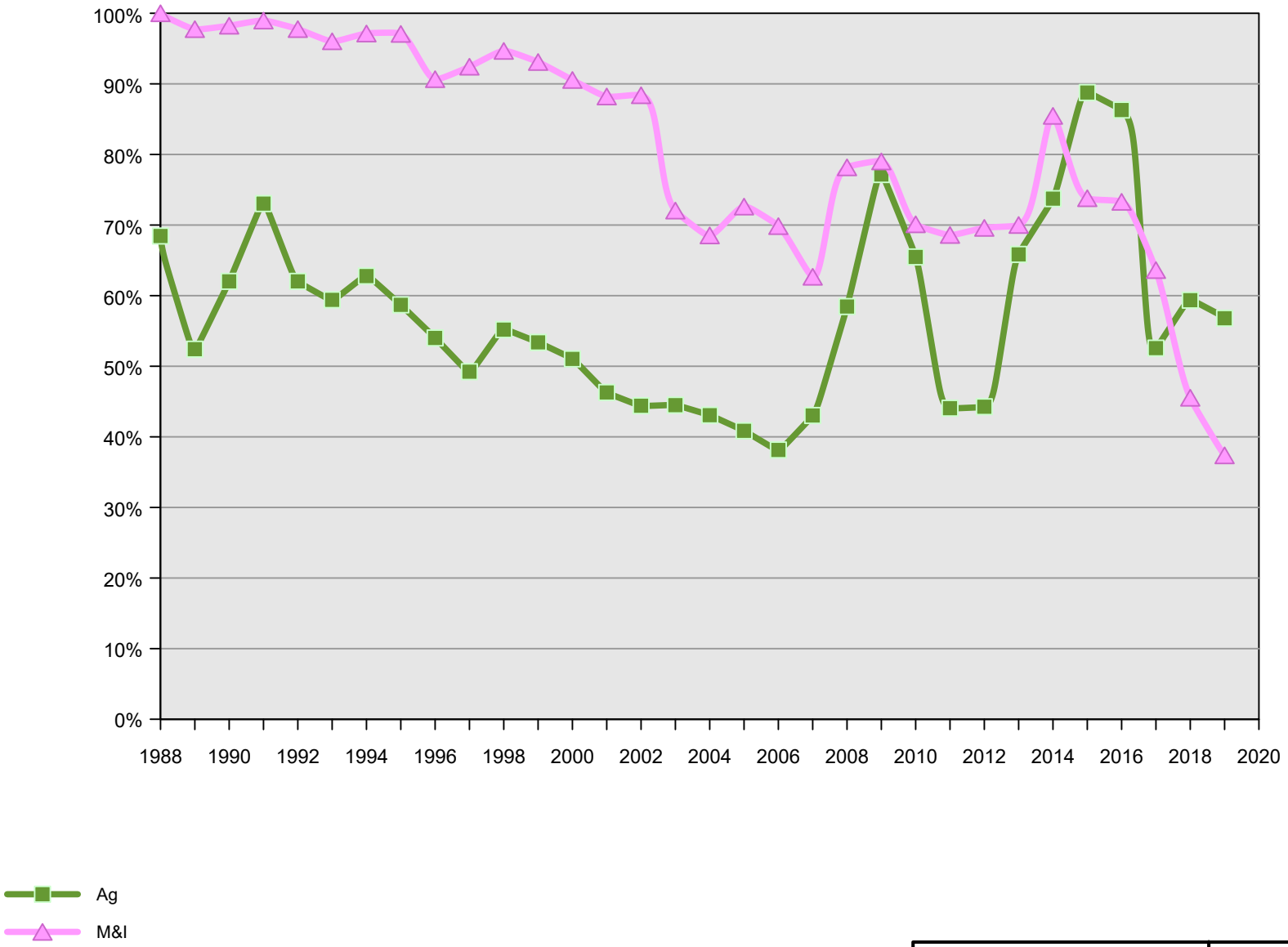
Groundwater (darker shade typ.)

December 2019

TODD GROUNDWATER

Appendix E-3
Total Subbasin Water Use by Water Type
Zone 6

Path: T:\Projects\San Benito Annual 37636\GRAPHICS\2019 Annual Groundwater Report\AppendixE-3.gpj

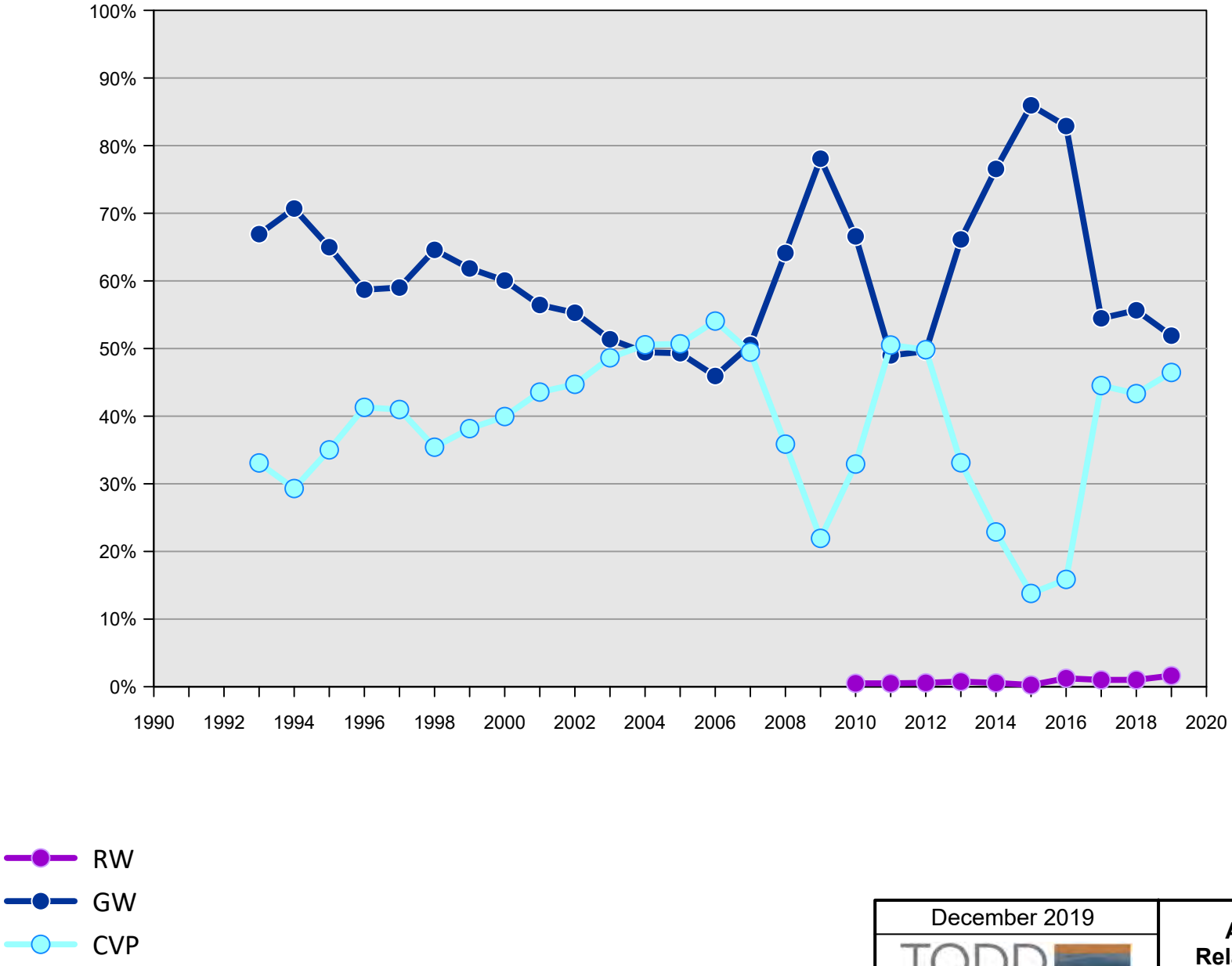


December 2019

TODD GROUNDWATER

Appendix E-4
Portion of Ag and M&I Supply Satisfied by Groundwater

Path: T:\Projects\San Benito Annual 37636\GRAPHICS\2019 Annual Groundwater Report\AppendixE-4.grp



December 2019

TODD GROUNDWATER

Appendix E-5
Relative Water Use by Supply Source

Path: T:\Projects\San Benito Annual 37636\GRAPHICS\2019 Annual Groundwater Report\AppendixE-5.gpj

APPENDIX F RATES AND CHARGES

List of Tables and Figures

Table F-1. 2018 Recommended Groundwater Revenue Requirement/Charges

Table F-2. Historical and Current San Benito County Water District CVP (Blue Valve) Water Rates

Table F-3. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

Table F-1. 2019 Recommended Groundwater Revenue Requirement/Charges

San Benito County Water District
Groundwater Rates
Water Year
2019-2020, 2020-2021, 2021-2022
Zone 6

REVENUE REQUIREMENTS				Rates[2]	
Component	**Rate ($/AF)**	**Quantity (A/F)[1]**	**Amount**	**Ag** (per A/F)	**M & I** (per A/F)
SOURCE OF SUPPLY O&M					
AG	$ 18.68	23,974	$ 447,851	$ 18.68	
M&I	$ 18.68	4,877	$ 91,110		$ 18.68
PERCOLATION COSTS					
Cost of Water					
AG Cost of Water[3]	$ 53.51	2,105	$ 112,612	$ 4.70	
M&I Cost of Water[3]	$ 163.58	428	$ 70,036		$ 14.36
Power Costs					
AG Power Charge for percolation	$ 58.83	2,105	123,812	$ 5.16	
M&I Power Charge for percolation	$ 58.83	428	25,188		$ 5.16
TOTAL				$ 28.54	$ 38.21
Current Groundwater Charge[4] (per acre foot)				$ 7.95	$ 24.25
RECOMMENDED Rate Basis (per acre foot)					
Water Year 2019-2020				**$ 12.74**	**$ 38.21**
Water Year 2020-2021				**$ 13.12**	**$ 39.36**
Water Year 2021-2022				**$ 13.51**	40.54
RECOMMENDED CHARGES (per acre foot)				**$ 12.75**	38.25
Water Year 2019-2020				**$ 13.15**	39.40
Water Year 2020-2021				**$ 13.55**	40.55
Water Year 2021-2022					

Notes:

1 Assumed Volumes
Groundwater usage (based on average of past 4 years)

Ag usage	23,974
M&I usage	4,877
Total	28,851

2 Rates=Revenue Requirements/projected groundwater usage
3 Cost of Water:
AG: USBR and SLDMWA O&M
M&I: USBR and SLDMWA O&M, USBR Out-of-Basin Interest
4 Groundwater charge adopted by San Benito County Water District Board of Directors in January 2017 (Ag) and January 2016 (M&I)
5 Assumed volumes for percolation (based on 3 year average)

Ag	83%	2105
M&I	17%	428
Total	100%	2533

6 Annual escalation rate 3%
7 Rates charged will be rounded up to nearest $.05

Note: Section 70-7.8 (a) of the District Act states that the agricultural rate shall not exceed one-third of the rates for all water other than agricultural water.

Table F-2. Historical and Current San Benito County Water District CVP (Blue Valve) Water Rates (dollars/af)

USBR Water Year	Standby & Availability Charge (dollars/acre)	Water Charge		Power Charge					Groundwater Charge (dollars/af)			Recycled Water (per AF)	
		Agricultural	Municipal & Industrial	Distribution Subsystem					Agricultural	Municipal & Industrial		Agricultural	Power Charge
				2	6H	9L	9H	Others					
1987	$8.00	$34.00	n.c.						n.i.	n.i.			
1988	$2.00	$34.00	n.c.						n.i.	n.i.			
1991	$4.00	$38.00	$110.00						$6.25	$22.00			
1992	$4.00	$45.00	$120.00						$2.00	$10.00			
1994	$4.50	$77.61	$168.92						$1.00	$5.00			
1995	$4.50	$77.61	$168.92						$1.00	$15.75	First 100 af		
										$36.70	Next 500 af		
										$54.60	Over 600 af		
1996	$6.00	$75.00	$150.00						$1.50	$33.00			
1997	$6.00	$75.00	$157.00						$1.50	$33.00			
1998	$6.00	$75.00	$155.00						$1.50	$33.00			
2000	$6.00	$75.00	$155.00						$1.50	$11.50			
2001	$6.00	$75.00	$155.00						$1.50	$25.00			
2004	$6.00	$75.00	$150.00	$24.30	$46.75	$25.05	$53.70	$15.25	$1.50	$10.00			
2005	$6.00	$80.00	$150.00	$26.15	$49.40	$35.00	$66.90	$17.10	$1.50	$21.50			
2006	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50			
2007	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50			
2008	$6.00	$100.00	$170.00	$17.25	$19.40	$32.60	$62.75	$14.85	$1.50	$21.50			
2009	$6.00	$115.00	$180.00	$17.50	$20.25	$42.55	$74.85	$16.30	$2.50	$22.50			
2010	$6.00	$135.00	$200.00	$22.00	$27.30	$49.75	$84.35	$21.75	$2.50	$22.50			
2011	$6.00	$155.00	$220.00	$22.70	$28.15	$51.25	$86.90	$22.40	$2.50	$22.50			
2012	$6.00	$170.00	$235.00	$23.35	$29.00	$52.80	$89.50	$23.10	$2.50	$22.50			
2013	$6.00	$170.00	$235.00	$40.30	$29.25	$43.05	$91.55	$22.40	$3.25	$23.25			
2014	$6.00	$170.00	$238.00	$41.55	$30.15	$44.35	$94.30	$23.10	$3.60	$23.25			
2015	$6.00	$179.00	$247.00	$42.75	$31.05	$45.70	$97.15	$23.80	$3.95	$23.25			
2016	$6.00	$272.00	$363.00	$123.10	$75.65	$109.95	$162.55	$66.05	$4.95	$24.25		$182.55	$57.70
2017	$6.00	$191.00	$363.00	$126.80	$77.90	$113.25	$167.45	$68.05	$6.45	$24.25		$183.45	$59.45
2018	$6.00	$209.00	$363.00	$130.60	$80.25	$116.25	$172.45	$70.10	$7.95	$24.25		$183.45	$59.45
2019	$6.00	$254.00	$404.00	$80.45	$39.30	$88.15	$130.30	$33.70	$12.75	$38.25		$183.45	$59.45

Notes:
af = acre-feet.
n.c. = no classification.
n.i. = not implemented
All rates effective March 1 through following February.

Table F-3. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

User Category and Cost Item	Irrigation[1]						Municipal & Industrial					
	Cost of service (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]	Cost of service[2] (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]
1994	$71.68	$6.20	n.a.		$77.88	$17.21	$165.67	$12.40	n.a.		$178.07	$85.86
1995	$66.47	$6.35	n.a.		$72.82	$17.21	$132.90	$12.69	n.a.		$145.59	$85.86
1996	$65.63	$6.53	n.a.		$72.16	$27.46	$127.40	$13.06	n.a.		$140.46	$85.86
1997	$69.57	$6.70	n.a.		$76.27	$27.46	$143.27	$13.39	n.a.		$156.66	$85.86
1998	$61.58	$6.88	$5.00		$73.46	$27.46	$130.88	$13.76	$5.00		$149.64	$85.86
1999	$60.30	$6.98	$2.73		$70.01	$27.46	$127.91	$13.96	$2.73		$144.60	$85.86
2000	$64.24	$7.10	$6.43		$77.77	$27.46	$129.59	$14.20	$6.43		$150.22	$85.86
2001	$69.50	$7.28	$2.65		$79.43	$27.46	$129.40	$14.56	$4.15		$148.11	$85.86
2002	$68.71	$7.54	$6.61		$82.86	$24.30	$130.32	$15.08	$6.61		$152.01	$79.13
2003	$72.20	$7.69	$5.46		$85.35	$24.30	$129.07	$15.38	$5.46		$149.91	$79.13
2004	$74.52	$7.82	$6.61		$88.95	$24.30	$134.86	$15.64	$6.61		$157.11	$79.13
2005	$77.10	$7.93	$7.99		$93.02	$24.30	$132.01	$15.87	$7.99		$155.87	$79.13
2006	$91.13	$8.24	$9.31		$108.68	$30.93	$214.41	$16.49	$9.31		$240.21	$77.12
2007	$93.53	$8.58	$9.99	$0.11	$112.21	$30.93	$215.32	$17.15	$9.99	$0.11	$242.46	$80.08
2008[6]	$28.12	$8.79	$10.95	$0.07	$47.93	$30.93	$33.34	$17.57	$10.95	$0.07	$61.68	$33.34
2009	$30.20	$9.06	$11.49	$0.07	$50.82	$30.20	$32.77	$18.12	$11.49	$0.07	$62.45	$32.77
2010	$33.27	$9.11	$11.91	$0.11	$54.40	$33.27	$36.11	$18.23	$11.91	$0.11	$66.36	$36.11
2011	$38.92	$9.29	$9.51	$0.05	$57.77	$38.92	$42.58	$18.59	$9.51	$0.05	$70.73	$42.58
2012	$39.71	$9.39	$15.20	$0.05	$64.35	$39.71	$37.95	$18.78	$15.20	$0.05	$71.98	$37.95
2013	$40.39	$9.79	$17.29	$0.05	$67.52	$39.91	$38.71	$19.58	$17.29	$0.05	$75.63	$40.92
2014	$46.87	$9.99	$28.81	$0.23	$85.90	$46.87	$29.70	$19.98	$28.81	$0.23	$78.72	$29.70
2015	$53.82	$10.07	$30.66	$0.23	$94.78	$53.82	$34.74	$20.14	$30.66	$0.23	$85.77	$34.74
2016	$85.12	$10.21	$30.66	$0.30	$126.29	$38.28	$61.24	$20.41	$30.66	$0.30	$112.61	$23.42
2017	$66.17	$10.23	$14.15	$0.30	$90.85	$39.90	$49.50	$20.45	$14.15	$0.30	$84.40	$22.85
2018	$79.09	$10.47	$20.39	$0.30	$110.25	$48.35	$43.74	$20.94	$20.39	$0.30	$85.37	$17.45
2019	$67.32	$10.63	$20.26	$0.30	$98.51	$40.14	$37.54	$21.26	$20.26	$0.30	$79.36	$17.98

Notes:

(1) Total USBR rate given for non-full cost users only, as they represent the majority of water users.

(2) Cost-of-service for agricultural and municipal and industrial users includes a capital repayment rate and an operation and maintenance (O&M) rate. For municipal and industrial customers, cost-of-service also includes a deficit charge, which includes interest on unpaid O&M and interest on capital and on unpaid deficit.

(3) Restoration fund charges apply October 1 through September 30. All other rates effective March 1 through following February.

(4) Beginning in 1998, the San Luis-Delta Mendota Water Authority instituted this charge to "self-fund" costs associated with maintaining the Delta-Mendota Canal and certain other facilities, which were formerly funded directly by the Bureau of Reclamation. SLDMWA issues preliminary rates in December for the upcoming contract year (March-February). These rates are used for rate-setting purposes; actual rates may vary.

(5) The contract rate is the minimum rate CVP contractors are allowed to pay. To the extent that the contract rate does not cover interest plus actual operation and maintenance costs, a contractor deficit is accumulated that is charged interest at the current-year treasury borrowing rate.

(6) Per the amendatory contract with the USBR "out of basin" capital costs that were previously included in the cost of service are now under a separate repayment contract.

(7) Cost of service rates are inclusive of USBR direct pumping and Project Use Energy costs.

APPENDIX G LIST OF ACRONYMS

List of Acronyms

AF or A/F	acre-foot
AFY	acre-foot per year
AG	agriculture
BMP	Best Management Practices
CASGEM	California Statewide Groundwater Elevation Monitoring
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
COC	Constituent of Concern
CVP	Central Valley Project
District or SBCWD	San Benito County Water District
CWD	County Water District
DDW	Division of Drinking Water
DWR	California Department of Water Resources
DWTP	Domestic Wastewater Treatment Plant
ET	evapotranspiration
ft	feet
GAMA	Groundwater Ambient Monitoring and Assessment
GICIMA	Groundwater Information Center Interactive Map
GPBO	General Basin Plan Objective
gpd	gallons per day
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GW	groundwater
HUA	Hollister Urban Area
IRWMP	Integrated Regional Water Management Plan
ITRC	Irrigation Training and Research Center, California Polytechnic State University
IWTP	Industrial Wastewater Treatment Plant
M&I	Municipal and Industrial
MA	Management Area
MCL	Maximum Contaminant Level
MGD	million gallons per day
msl	mean sea level
MW	Monitored well
NGVD	National Geodetic Vertical Datum
pdf	Adobe Acrobat Portable Document Format
PPWD	Pacheco Pass Water District
PVWMA	Pajaro Valley Water Management Agency
RW	recycled water
RWQCB	Regional Water Quality Control Board

List of Acronyms (cont.)

SCVWD	Santa Clara Valley Water District
SEIR	Supplemental Environmental Impact Report
SGMA	Sustainable Groundwater Management Act
SLDMWA	San Luis & Delta-Mendota Water Authority
SMCL	Secondary Maximum Contaminant Levels
SSCWD	Sunnyslope County Water District
USBR	U.S. Bureau of Reclamation
UWMP	Urban Water Management Plan
WRA	Water Resources Association of San Benito County
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WY	water year

2020

Annual Groundwater Report

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ANNUAL GROUNDWATER REPORT 2020

December 2020

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Appendix B Climate Data
Appendix C Hydrological Data
Appendix D Percolation Data
Appendix E Water Use Data for Zone 6
Appendix F Rates and Charges
Appendix G List of Acronyms

EXECUTIVE SUMMARY

This Annual Groundwater Report for San Benito County Water District (District) describes groundwater conditions in the San Benito County portions of the North San Benito Subbasin of the Gilroy-Hollister Basin. Consistent with past reports, this Annual Report focuses on the District's Zone 6, the zone of benefit for importation of Central Valley Project (CVP) water supply. The Report is prepared at the request of the District Board of Directors and is consistent with the special act of the State that established the District. It documents water sources and uses, groundwater elevations and storage, and management activities for Water Year 2020 and it provides recommendations. Water Year 2020 was characterized by below average rainfall, below average CVP allocations, and stable to slightly decreased groundwater storage in parts of the basin.

This Water Year, the District has continued to develop their Groundwater Sustainability Plan (GSP) in compliance with the Sustainable Groundwater Management Act (SGMA). The area of the plan is the North San Benito Groundwater Subbasin, a Subbasin approved by the Department of Water Resources (DWR) in 2019 that includes the former Hollister, San Juan, and Bolsa subbasins as well as Tres Pinos Valley Basin. The District, as Groundwater Sustainability Agency (GSA) is leading preparation of the Groundwater Sustainability Plan (GSP) in cooperation with the Santa Clara Valley Water District (SCVWD) GSA. Upon adoption by the District and SCVWD boards, the GSP will provide the information and tools for continued groundwater management.

After completion of the GSP, expected late 2021, the District will be required to submit Annual GSP Reports to DWR. This 2020 Annual Groundwater Report continues a transition to an annual groundwater report that meets the requirements of the District Act and satisfies SGMA requirements. This includes expanding the report coverage to address the entire North San Benito Subbasin. The requirements of an Annual Report under SGMA are similar to the current Annual Groundwater Report but will require submittal of the Report to the DWR web portal along with completed data tables with information on water levels and water use. The Annual Groundwater Report for Water Year 2020 includes a detailed list of requirements for a SGMA Annual Report including data uploads and a description of progress towards GSP implementation.

The District has effectively managed water resources in San Benito County for decades. Working collaboratively with other agencies, the District has eliminated historical overdraft, developed and managed multiple sources of supply, established an effective water conservation program, protected water quality, and provided annual reporting. Water Year 2020 witnessed a continuation of these collaborative efforts and significant progress in developing the GSP. The continued partnership of the Hollister Urban Area (including the District, City of Hollister, and Sunnyslope County Water District (SSCWD)) resulted in increased water treatment capacity that significantly enhances opportunities for conjunctive use of CVP and groundwater and improves delivered water quality for municipal costumers. The District's continued public outreach—including preparation of Annual Groundwater Reports—has been an asset to the GSP process and is a foundation for future groundwater management.

1-INTRODUCTION

The San Benito County Water District (District or SBCWD) was formed in 1953 by a special act (District Act) of the State with responsibility and authority to manage groundwater. The District Act authorizes the Board of Directors, at its discretion, to direct staff to prepare an annual investigation and report on groundwater conditions of the District and its zones of benefit, such as Zone 6, the area for distribution of Central Valley Project (CVP) water. As documented in **Appendix A,** the District Act specifies the minimum content of the report should the District choose to prepare one. Annual Reports have been prepared historically to analyze the status of the groundwater basin, to evaluate conditions in the next year, and to provide management recommendations.

With passage of the Sustainable Groundwater Management Act (SGMA) in 2014, the State has created a new framework for groundwater basin management, monitoring, and reporting by local agencies. The District has responded proactively. The District is the exclusive Groundwater Sustainability Agency (GSA) for the North San Benito Groundwater Basin in San Benito County shown on Figure 1-1. This basin was formerly defined as three separate subbasins of the Gilroy-Hollister basin and the Tres Pinos Valley basin. The District is currently preparing a Groundwater Sustainability Plan (GSP) for the North San Benito Basin in cooperation with Santa Clara Valley Water District (SCVWD), which is the GSA for the small portions of the basin within Santa Clara County.

As presented in the GSP, the North San Benito Groundwater Basin has been divided into four management areas, shown in **Figure 1-2**. These management areas are designed to facilitate implementation of the GSP. As of November 2020, the District and Todd Groundwater have completed and made publicly available six draft sections of the plan, participated in three public workshops, and thirteen Technical Advisory Committee meetings. After the GSP is approved and submitted to DWR, the District GSA is responsible for preparing SGMA Annual Reports. The SGMA requirements are similar to the District Act requirements but diverge in the specific data sets that must be included; these specifics are discussed further in Section 6. A notable difference between the requirements is the deadline for submittal. While the Annual Report according to the District Act must be submitted to the board by the second week of December after the end of the water year, the SGMA Annual Report must be submitted by April 1 after the end of the water year. The Annual Groundwater Report for Water Year 2020 follows the District Act. Next year, SGMA requires submittal of an Annual Groundwater Report for Water Year 2021 by April 1; it is recommended that the report submittal schedule be shifted to the April 1 deadline.

Consistent with the District Act and prepared at the request of the Board, this Annual Report documents water supply sources and use, groundwater elevations and storage, and District management activities from October 2019 through September 2020. It fulfills the minimum content for a District Annual Report and presents an overview of the state of the groundwater basin with recommendations for management. It conveys considerable information, including tables and figures, which are provided largely in **Appendices B through E**. **Appendix F** provides information on water rates and charges and **Appendix G** contains a list of acronyms.

The 2020 Annual Groundwater Report strives to maintain consistency with past Annual Reports while also providing a path to fulfill future requirements for SGMA Annual Reports. Water Year 2020 is the last annual report focused on Zone 6, as described in the District Act. Beginning with Water Year 2021, the Annual Groundwater Report will become a SGMA Annual Report and will comply with SGMA regulations and will satisfy the monitoring and reporting requirements in the District Act.

Acknowledgments

This report was prepared by Iris Priestaf, PhD, Maureen Reilly, PE, Arden Wells, and Chad Taylor, PG, CHG of Todd Groundwater. We appreciate the assistance of San Benito County Water District staff, particularly Jeff Cattaneo, Sara Singleton, Garrett Haertel, and David Macdonald.

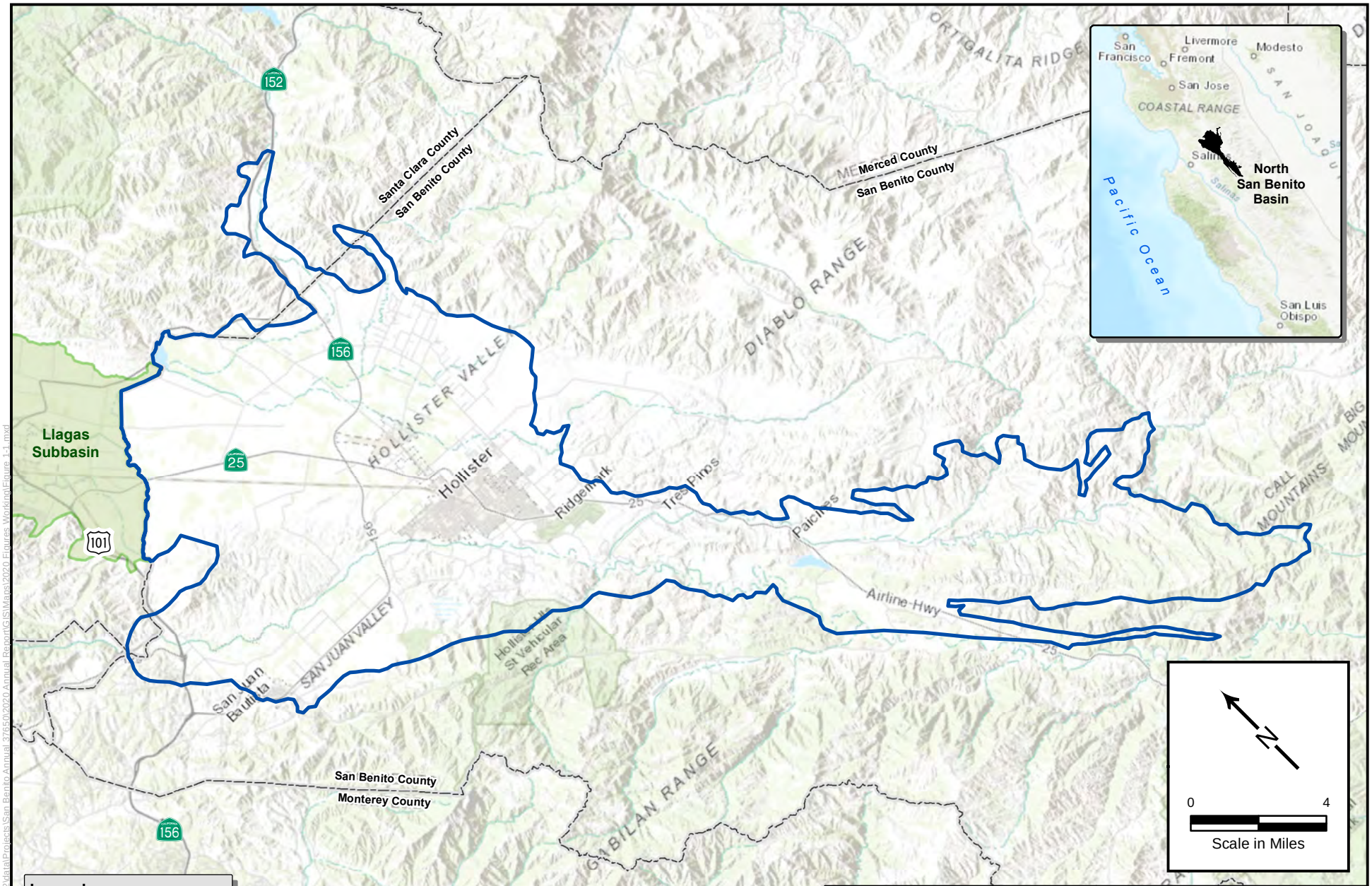

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Figure 1-1
North San Benito Groundwater Basin

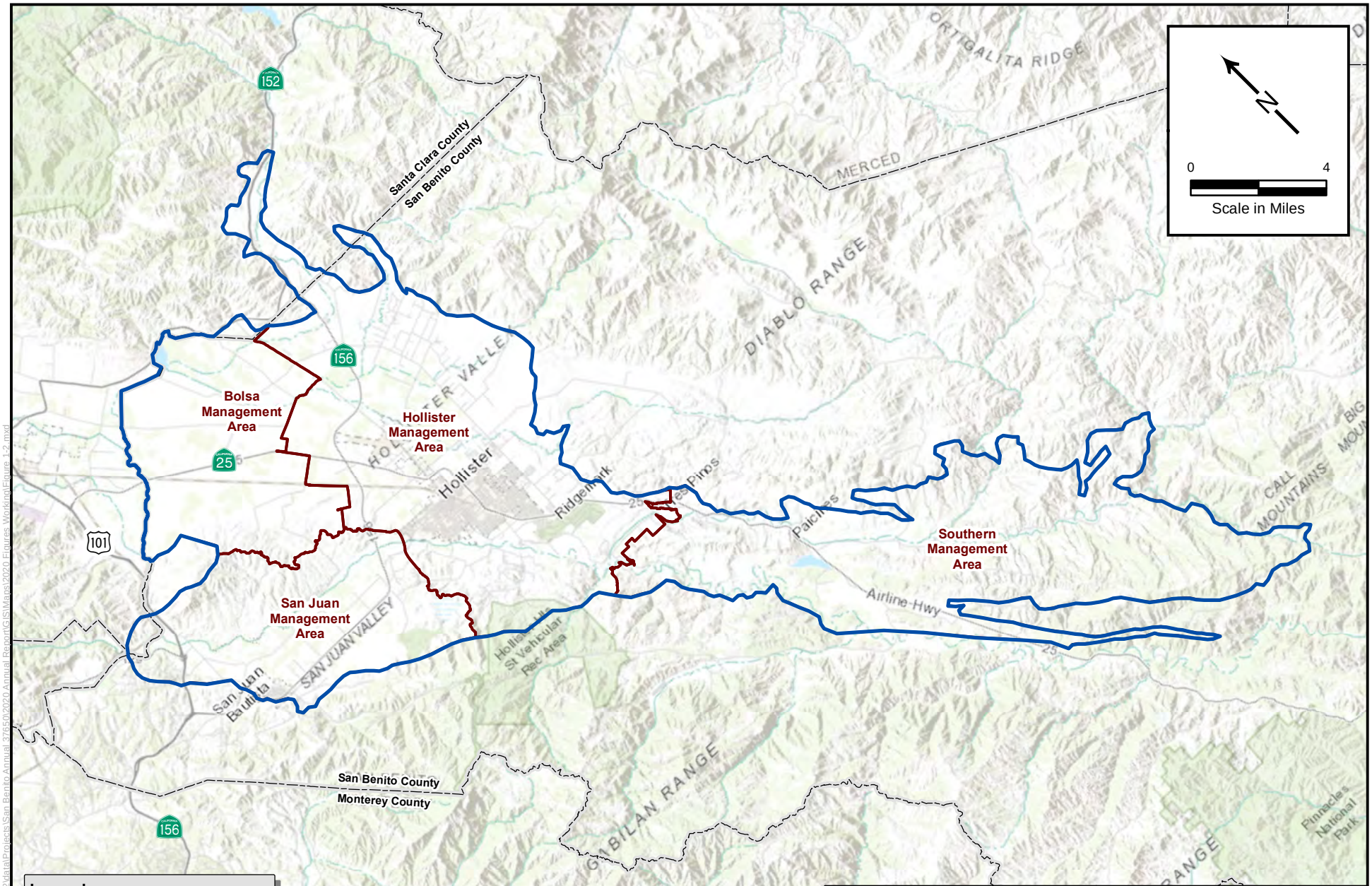

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Figure 1-2
Proposed GSP Management Areas

2 – GEOGRAPHIC AREA

The geographic area and boundaries of local groundwater basins have been defined differently by the District and by the California Department of Water Resources (DWR) for their specific purposes. Like previous annual reports, this Annual Report has a focus on the San Benito County portions of the Gilroy-Hollister Groundwater Basin, including the previously defined Bolsa, Hollister, and northern San Juan Bautista subbasins. Nonetheless, it is recognized that the North San Benito Basin (Basin)[1] includes portions in Santa Clara County and that it extends farther to the south; the entire basin is the subject of the GSP. To support a transition to SGMA, the monitoring program is being improved and expanded.

District-Defined Subbasins

For the past 25 years, the Annual Reports have focused on subbasins delineated in 1996 and based on hydrogeologic and other local factors (e.g., Zone 6 boundaries). These subbasins are shown in **Figure 2-1** in light blue. Six of these subbasins are defined within Zone 6, including Bolsa Southeast (SE), Pacheco, Hollister East (North and South), Tres Pinos, Hollister West, and San Juan subbasins. The seventh is the Bolsa subbasin; of the subbasins shown on the map, only the Bolsa subbasin receives no direct CVP deliveries and relies on local groundwater.

DWR-Defined Basin

As the District proceeds with SGMA planning and implementation, its area of focus is changing from the 1996-defined subbasins and Zone 6 to the North San Benito Basin and GSP area outlined in **Figure 1-1**, in dark blue. All groundwater basins defined by DWR as wholly or partially in San Benito County are shown in **Figure C-1** in **Appendix C.**

Next year, the SGMA Annual Report will report data only on the management areas, shown in red on **Figure 1-2,** not on the District-defined subbasins. The four proposed Management Areas (MAs) have been defined as part of the GSP process to facilitate implementation. A major factor in defining MAs is availability of water sources (e.g., CVP) and Zone 6. While recognizing that water supply availability (in terms of sources, infrastructure, and institutional arrangements) can change in the future, current availability is a reasonable starting point. SBCWD provides local surface water from Hernandez and Paicines reservoirs to a local zone of benefit, Zone 3, and provides imported Central Valley Project (CVP) water to Zone 6. The District-defined subbasins also relied on Zone 6 as a boundary and thus the District-defined subbasins generally fall within the boundaries of the MAs.

[1] The official nomenclature is North San Benito Subbasin of the Gilroy Hollister Basin; it has been assigned DWR Basin Number 3-003.05. For the purposes of this report, it is referred to as North San Benito Basin to clearly differentiate it from previous DWR-defined subbasins and from previous SBCWD-defined subbasins.

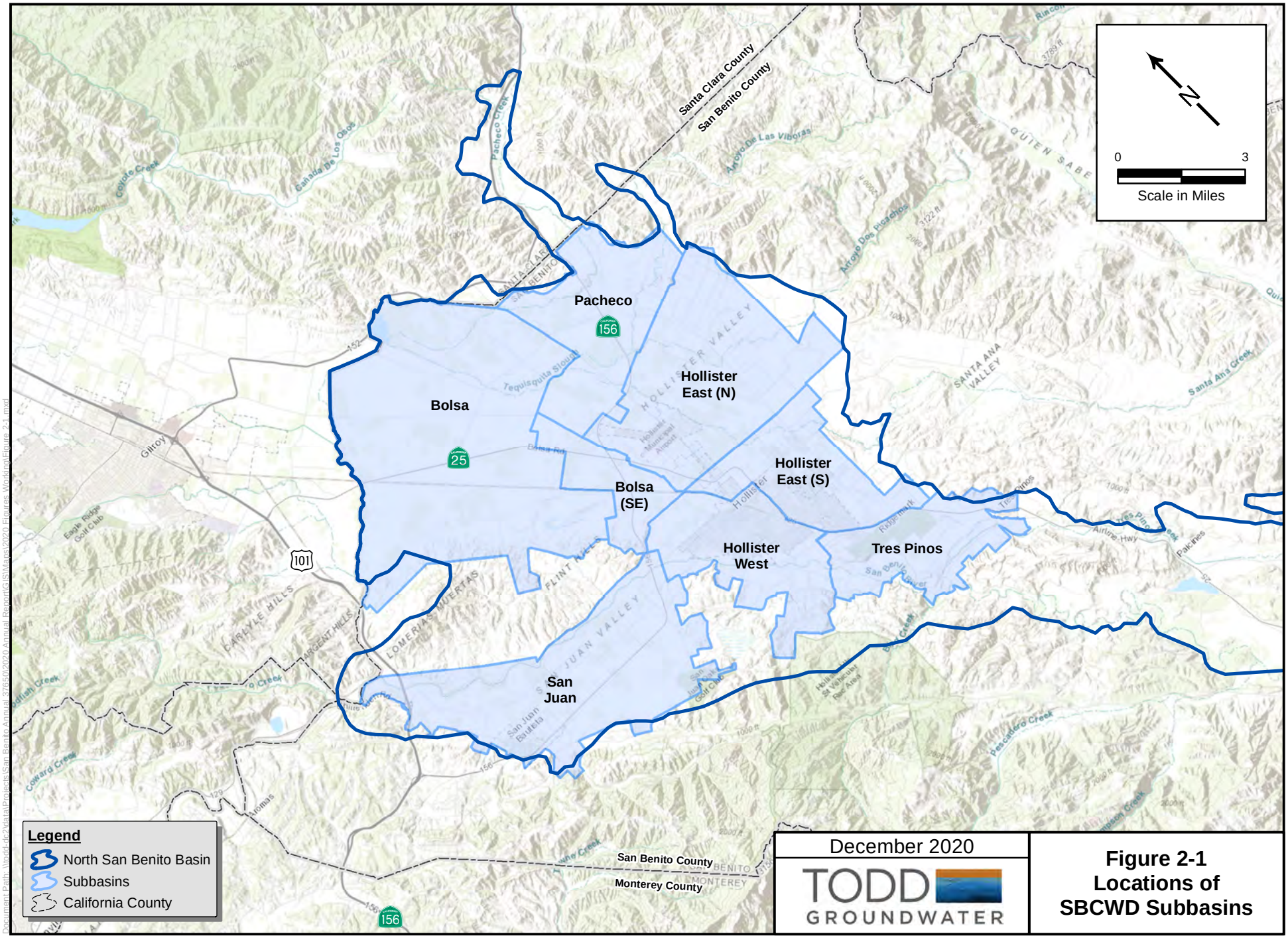

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Figure 2-1
Locations of SBCWD Subbasins

2 – GEOGRAPHIC AREA

The four Management Areas (MAs) are listed below with the District-defined subbasins that they generally encompass:

- Southern MA
- Hollister MA (includes Tres Pinos, Hollister East and West, Bolsa SE, Pacheco subbasins)
- San Juan MA (includes almost all District-defined San Juan subbasin)
- Bolsa MA (includes almost all District-defined Bolsa subbasin)

Hollister and San Juan MAs include portions of Zone 6; Southern and Bolsa MAs do not.

Ongoing District Monitoring Programs

Data from monitoring programs undertaken by local, state, and federal agencies are summarized below as currently incorporated in the Annual Report. The District data compilation and monitoring programs will be expanded and revised in the future as data needs are identified in the GSP, for example to address topics such as potential groundwater dependent ecosystems, and to represent the entire North San Benito Basin.

Climate. Climate data are regularly compiled from DWR's California Irrigation Management Information System (CIMIS) and include: total solar radiation, soil temperature, air temperature/relative humidity, wind direction, wind speed, and precipitation. Additional precipitation data are available from the WRCC station at Hollister from 1934-2020 (WRCC 2020). For the Annual Groundwater Reports, historical annual precipitation has been compiled and reported using the Hollister rain gage for the long-term precipitation and the CIMIS San Benito station for recent monthly precipitation. Monthly precipitation and evapotranspiration for the Hollister #126 CIMIS station are tabulated in **Appendix B**.

Groundwater levels. SBCWD has had a semi-annual groundwater level monitoring program since Water Year (WY) 1977; groundwater level data gathered by USGS and other agencies are available as early as 1913 (Clark, 1924). The Annual Groundwater Reports provide quarterly groundwater level data in **Appendix C** for each year. The data are the basis for groundwater level contour maps, change maps, hydrographs, and storage change computations presented in the Annual Reports. The SBCWD monitoring program includes wells in the Pacheco Valley in Santa Clara County. SCVWD's monitoring program provides data for the southern Llagas Subbasin; these shared data are used in the SBCWD annual groundwater level maps.

SBCWD is the designated CASGEM monitoring agency for the GSP Area; CASGEM data are available from DWR's online Groundwater Information Center Interactive Map (GICIMA).

Water quality. In 1997, SBCWD initiated a program for monitoring nitrate and electrical conductivity (EC) in wells. In 2004, SBCWD established a comprehensive water quality database with records from all water systems and regulated facilities. The database is updated triennially as part of the Annual Report update. Monitoring for the Salt and Nutrient Management Plan is closely coordinated with ongoing monitoring and Annual Report updates. State-wide sources of groundwater quality data include the Water Data Library (WDL), Geotracker/GAMA program, and the State Water Resources Control Board's

Division of Drinking Water. These are accessed for the triennial update of the SBCWD Water Quality Database; the next update is planned for the Annual Report Water Year 2022.

Reservoirs. The Annual Report summarizes reservoir water budget information for Hernandez, Paicines, and San Justo reservoirs and provides annual total releases from Hernandez and Paicines reservoirs from Water Year 1996 to present. Reservoir storage and release data are available in **Appendix D**.

Surface water flows and percolation. Surface water monitoring and percolation are summarized in **Appendix D** of the Annual Groundwater Reports. For Water Year 1994 to present, percolation of imported CVP water is documented in **Table D-3** and percolation of wastewater is shown in **Tables D-4 and D-5**. The District temporarily suspended its surface water monitoring network but plans to relaunch surface water monitoring at selected sites as part of SGMA implementation. This water year, the District continues to expand their off-stream percolation locations for CVP recharge, including the addition of the Hollister percolation ponds located off stream along the San Benito River.

Wells and groundwater pumping. SBCWD monitors groundwater pumping in Zone 6 using electrical meters. Pumping amounts are calculated semiannually by metering the number of hours of pump operation and multiplying by the average discharge rate. This monitoring program began in about 1990 (soon after CVP imports started) and was based on recognition that CVP imports resulted in reduced pumping, increased recharge, and sustainable groundwater storage with regional benefits to groundwater users. Irrigation pumping beyond Zone 6 is not monitored but has been estimated for regular water budget updates based on land use information and water use factors. This method of estimating groundwater pumping will be replaced as part of SGMA implementation. The District is currently developing a new water use monitoring program that will address the entire GSA area and will be documented in future SGMA Annual Reports. Groundwater pumping estimates using the existing method for Zone 6 are summarized by major use category and subbasin in **Appendix E**, which also provides information on CVP use in Zone 6.

Units and accuracy. Throughout this report, water volumes and changes in storage are shown to the nearest acre-foot (AF). These values are accurate to one to three significant digits (depending on the measurement). All digits are retained in the text to maintain as much accuracy as possible during subsequent calculations, but results should be rounded appropriately.

3-GROUNDWATER CONDITIONS

The Annual Report summarizes basin conditions including climate, groundwater elevations, groundwater storage, and groundwater level trends. Overall, Water Year 2020 was a below-average hydrologic year, and while the above-average CVP allocations of the last USBR year carried over to this water year, new allocations were also below average.

Climate

Assessment of climatic conditions begins with collection of climate data (rainfall and evapotranspiration), which are summarized in **Appendix B**. Local rainfall amounts are compiled on a monthly basis and reviewed as an increasingly variable factor that affects basin inflows (e.g., deep percolation) and outflows (groundwater pumping). Recognizing that drought often is extensive across California, local dry years also may be indicative of regional drought and reduced CVP allocations. Dry years often are characterized by increased groundwater pumping for agricultural irrigation to offset lack of rainfall and reduced CVP allocations.

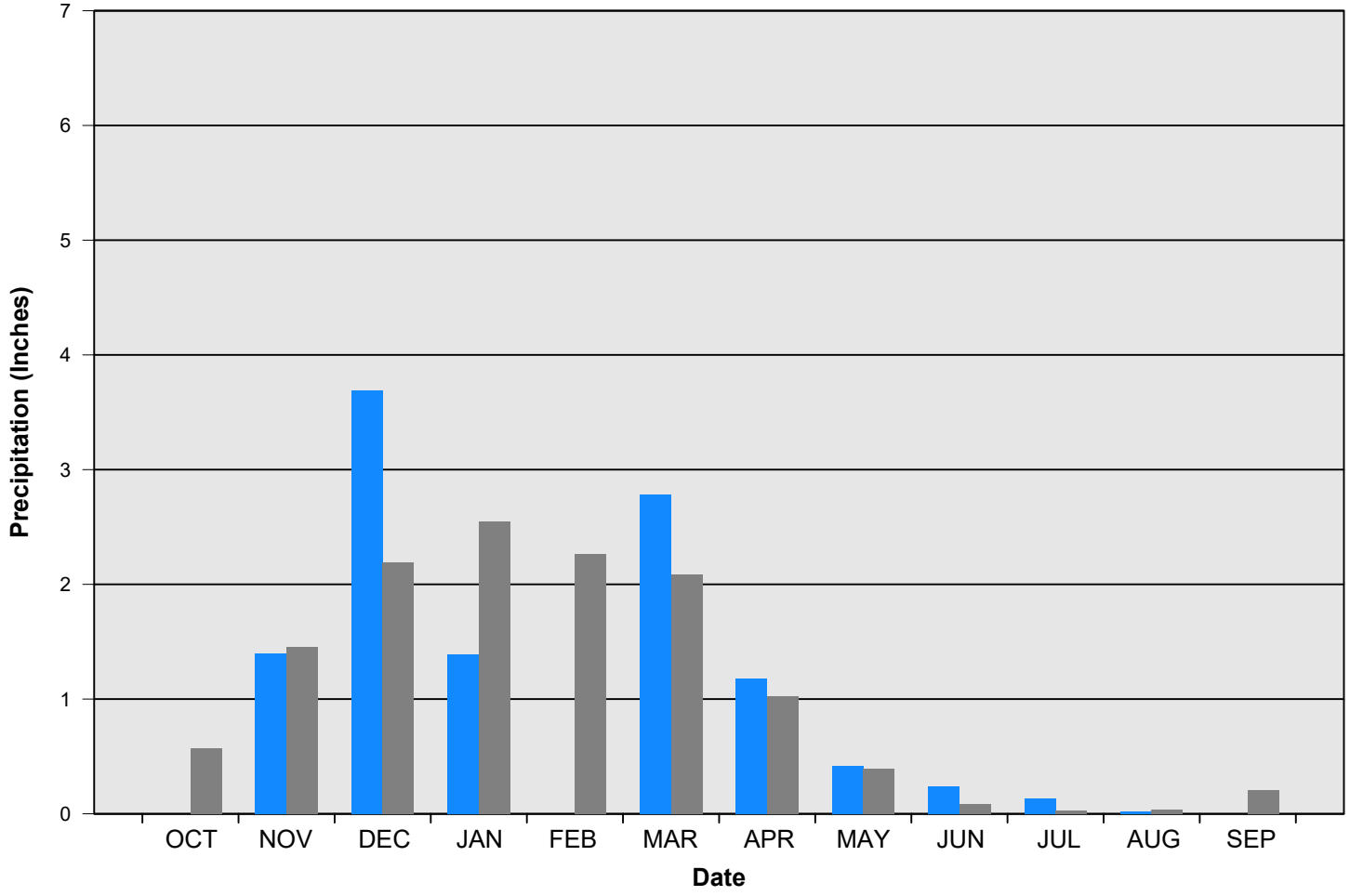
In 2020, overall precipitation was 11.25 inches; monthly totals are shown in **Figure 3-1.** December and March received higher than normal precipitation, but January and February were relatively dry. Monthly rainfall and evapotranspiration data can be found in **Appendix B**. Water year 2020 was below normal with only 87 percent of the long term average, as illustrated in **Figure 3-2**, which shows annual precipitation and water year type from 1976 through 2020. NOAA's weather forecast for the winter 2020-2021 predicts a 33 to 50 percent chance of less than average rainfall for the central coast region (NOAA 2020).

The Annual Report has relied on CIMIS station #126 since Water Year 1995. The station, located in Hollister, is hosted by the District and maintained by DWR. In recent years, precipitation data have been affected by periodic irrigation overspray that has been recorded on the sensors.

Groundwater Elevations

In October 2020, the District collected groundwater elevations in 91 wells from their existing network and 9 additional wells from Santa Clara Valley Water District. **Figure 3-3** shows the well locations in the current monitoring network and **Figure 3-4** shows the groundwater elevation contours for October 2020. The maps do not include the southernmost portions of the North San Benito Basin where no groundwater level monitoring wells currently are located.

Over 2020, groundwater elevations declined slightly throughout most the basin. For the past three years, the basin had been recovering from the most recent drought (2013-2016). This year's decline in groundwater storage signals a pause to that recovery; groundwater levels may decline further with the reduced CVP allocations for this year and with a relatively dry winter. More information is in **Appendix C.**



2020 - (11.25 in)

Average - (12.9 in)

Source: CIMIS

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Figure 3-1
Water Year 2020
Precipitation

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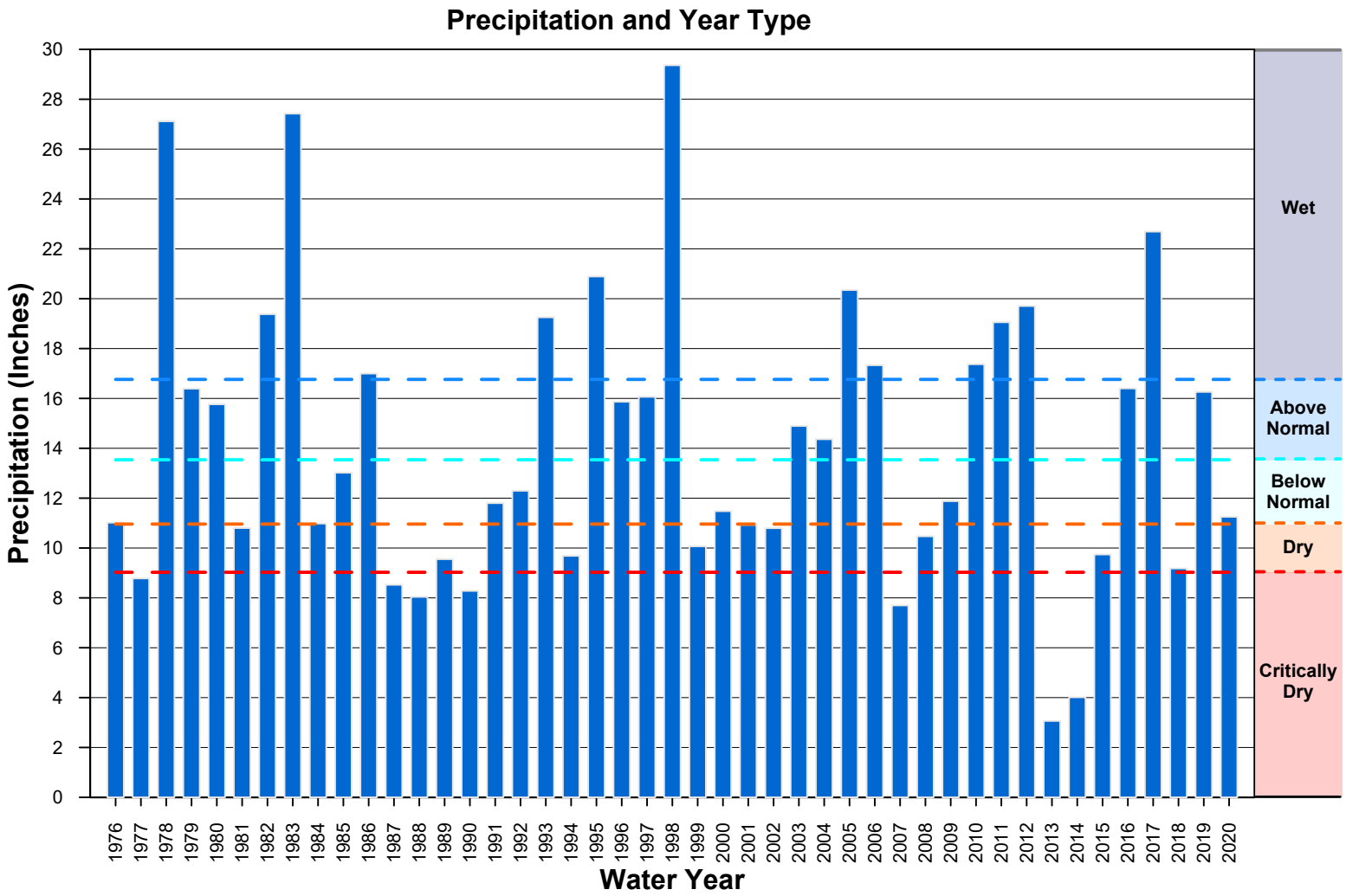

Source: WRCC Hollister 1 and Hollister 2 Stations

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Figure 3-2
Annual Precipitation
1976-2020

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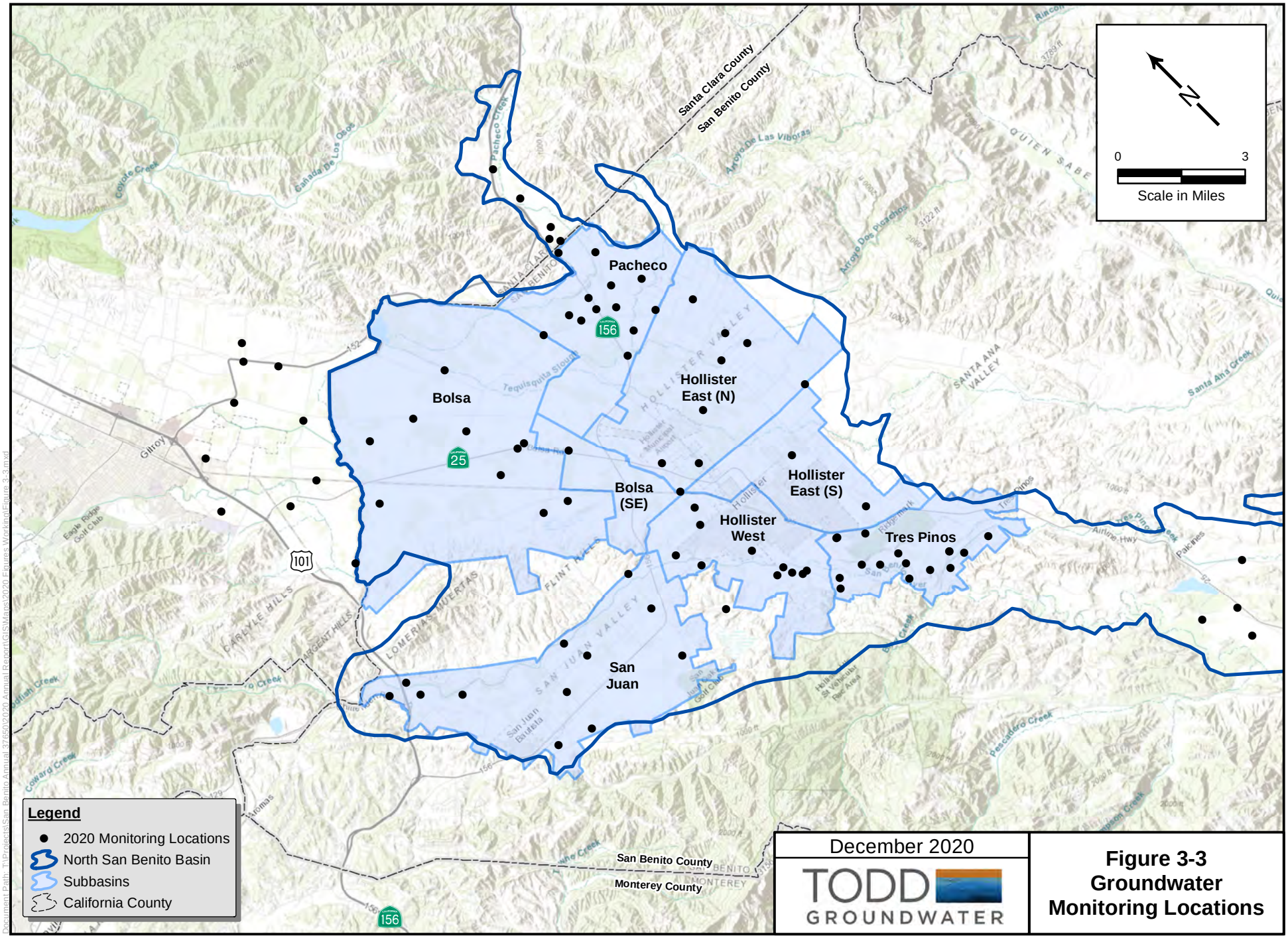

Figure 3-3 Groundwater Monitoring Locations

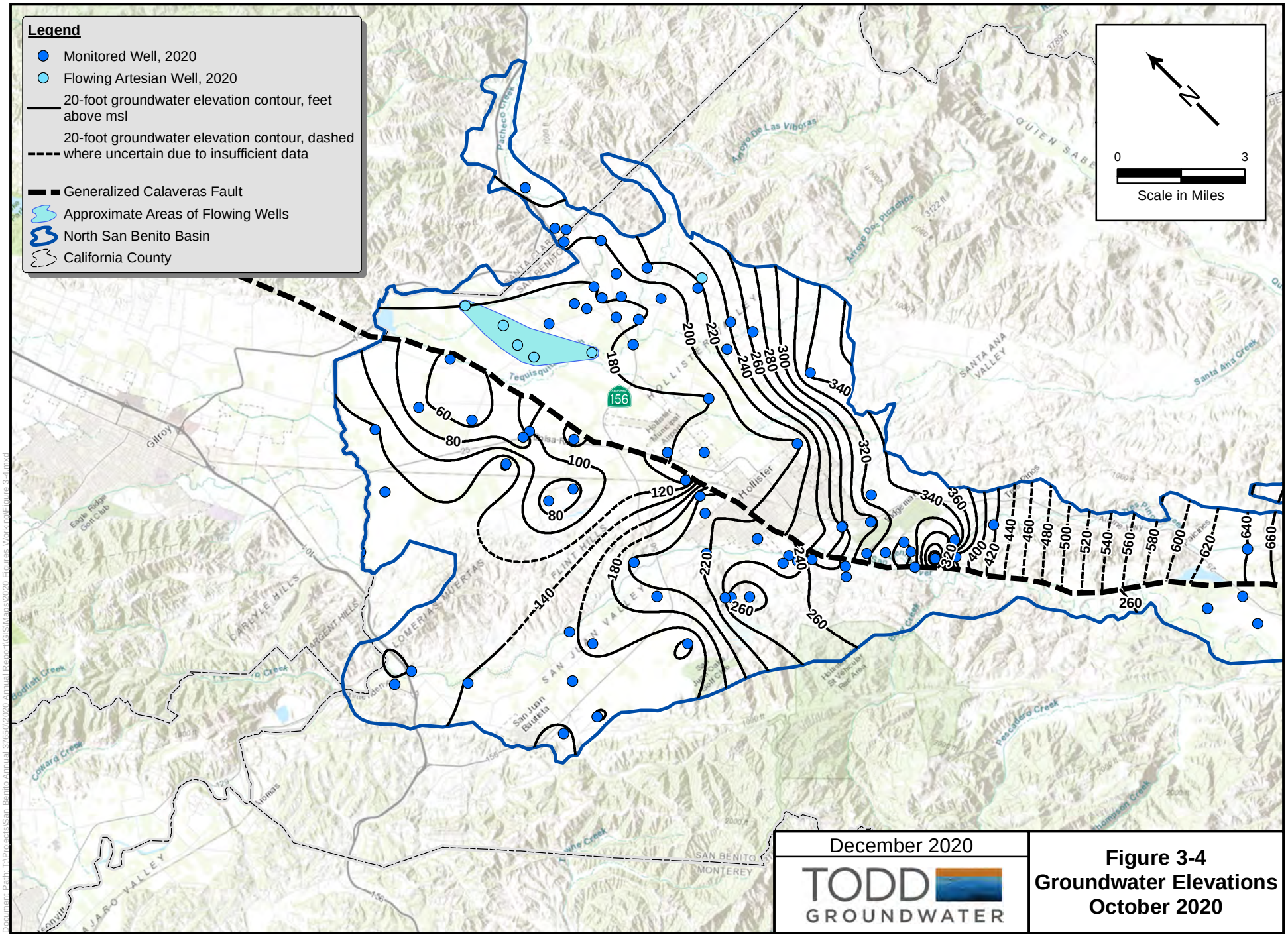

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Figure 3-4
Groundwater Elevations
October 2020

Change in Storage

Change in groundwater in storage was calculated using the groundwater elevation changes from October 2019 to October 2020. In **Figure 3-5**, change is displayed spatially with a color ramp (see legend), ranging from red (that would indicate as much as a 65-foot decline in groundwater levels) to blue (that indicates a 65-foot or more increase in levels). Relative to 2019 most areas have shown slight decreases (less than 20 feet). The apparent large groundwater level decrease (more that 50 feet) in the southern area is mostly due to missing measurements from a well that was inaccessible in 2020. In Zone 6, the negative change in storage this water year (5,820 AFY) is similar to the positive change in storage observed last year from 2018 to 2019 (6,123 AFY). **Figure 3-6** is a stacked bar graph that shows the change in storage by subbasin from 2006 to 2020.

Change in storage is the net volume of water added to or removed from the basin over the water year. The change in storage was determined by first calculating the total bulk change in volume by multiplying the change in groundwater elevations (feet) and by the total area (acres). This bulk change in volume was then multiplied by the average storativity of the subbasin, namely the amount of water produced from a given volume of the aquifer. The storativity values for each subbasin were derived from previous numerical models of the basin, and these values have been used in all previous Annual Reports. **Table 3-1** documents the change in groundwater storage; as in previous Annual Reports, change in storage is reported on the basis of the 1996 District-defined subbasins, Zone 6, and the total of these subbasins.

As part of SGMA implementation, future groundwater storage change will be calculated by the numerical model. The new numerical model developed for the GSP can calculate storage change volumetrically (inflow-outflow) instead of by groundwater elevation change, so its estimate may vary from storage changes calculated for the Annual Reports. For Water 2021, the SGMA annual report will include an update of the model inflows and outflows. The simulated change in storage will be presented in the Water Year 2021 Annual Report.

Table 3-1. 2020 Change in Groundwater Storage

1996-defined Subbasin	Subbasin Area (Acres)	Average Change in Groundwater Level (feet)	Average Storativity	Change in Storage (Acre-Feet)
San Juan	11,708	(5.78)	0.05	(3,383)
Hollister West	6,050	2.26	0.05	684
Tres Pinos	4,725	(7.63)	0.05	(1,803)
Pacheco	6,743	(3.23)	0.03	(654)
Northern Hollister East	10,686	(1.61)	0.03	(516)
Southern Hollister East	5,175	(1.19)	0.03	(185)
Bolsa SE	2,691	0.17	0.08	37
TOTAL ZONE 6				**(5,820)**
Bolsa	20,003	(3.29)	0.01	(658)
TOTAL All Subbasins				**(6,478)**

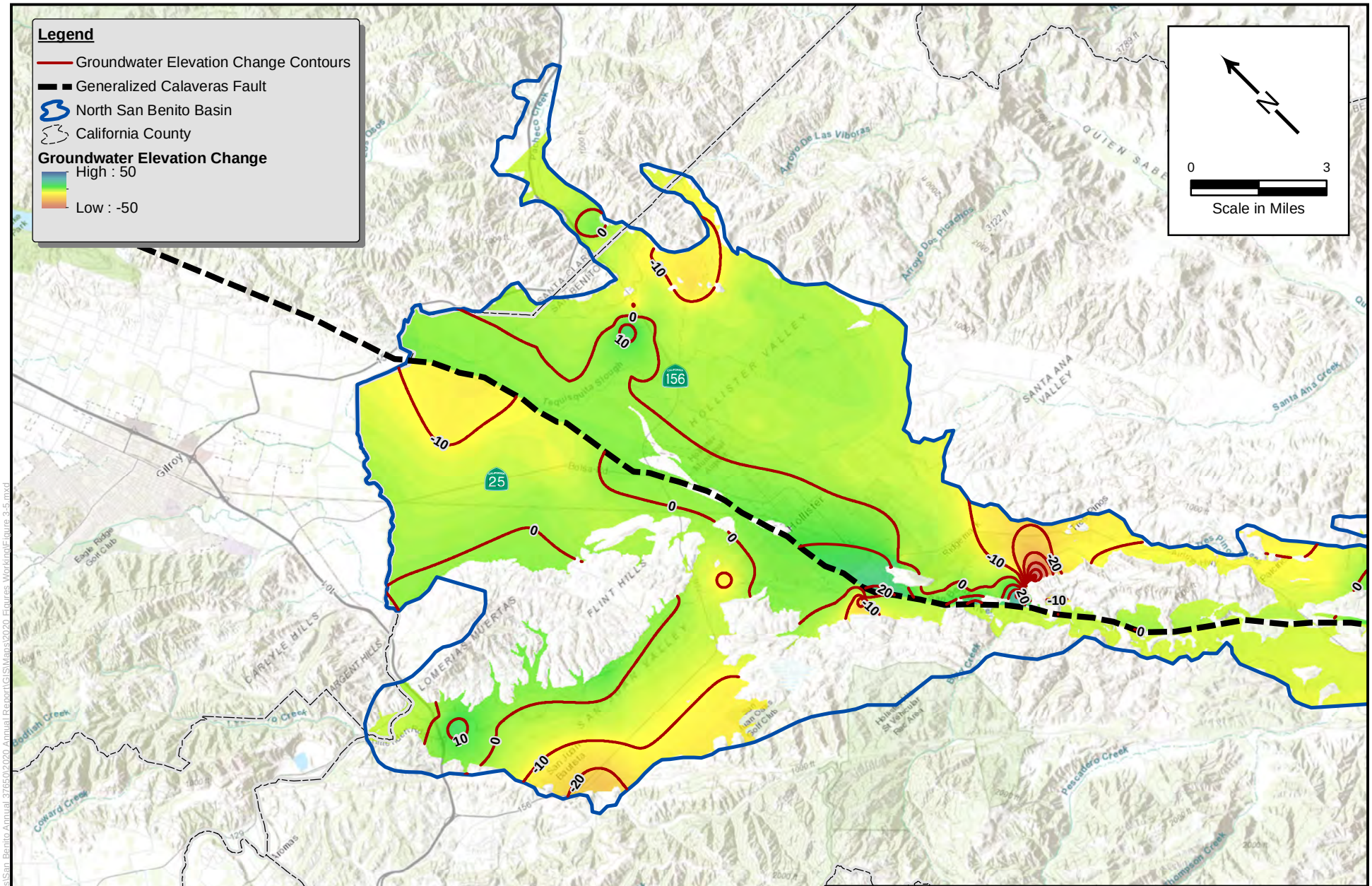

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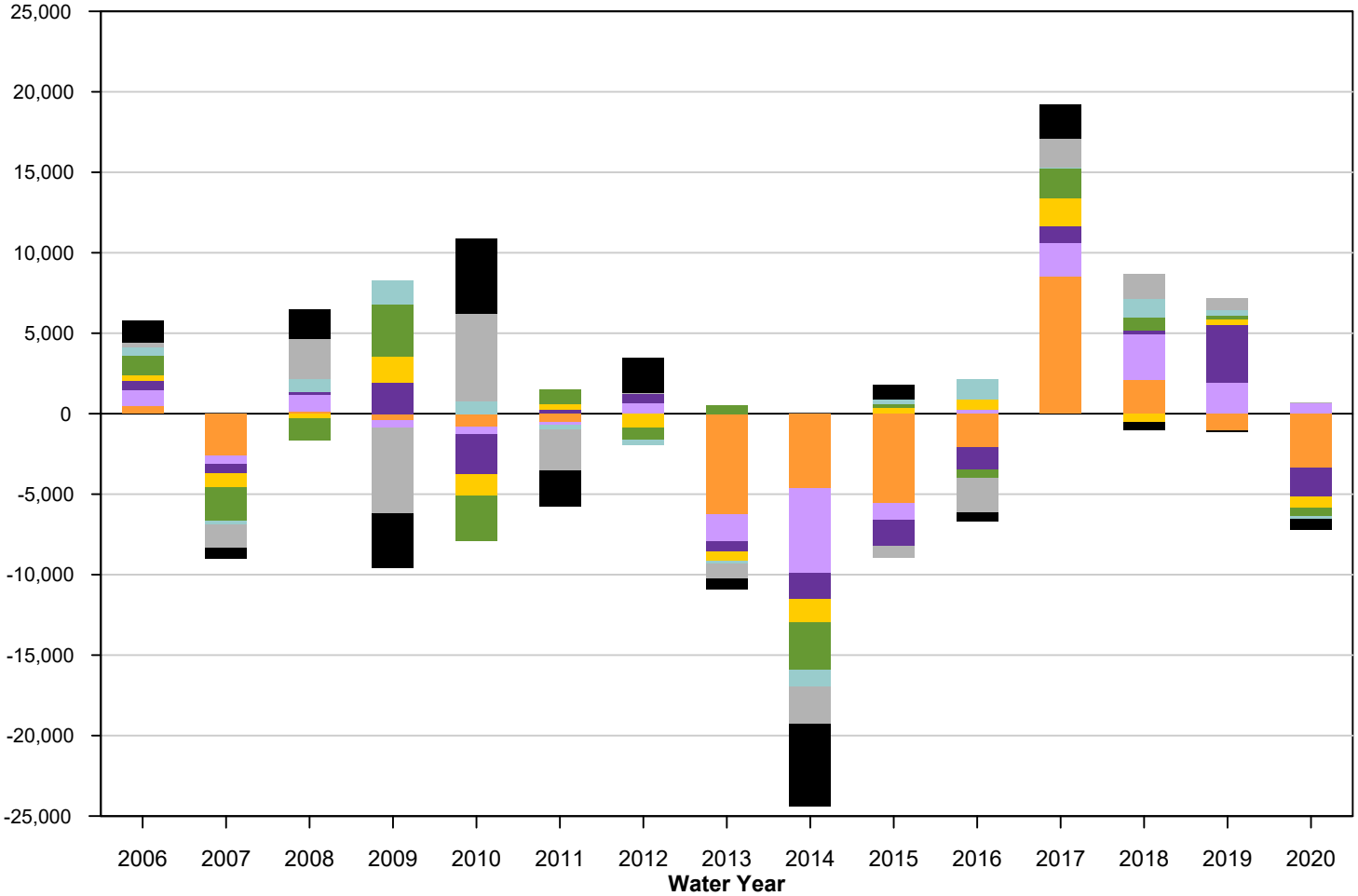
Figure 3-5
Change in Groundwater Elevations, 2019-2020



San Juan
Hollister West
Tres Pinos
Pacheco
Northern Hollister East
Southern Hollister East
Bolsa SE
Bolsa

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Figure 3-6
Change In Storage

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Groundwater Trends

Figure 3-7 shows hydrographs of key wells, illustrating long term groundwater elevation changes throughout the basin. These wells and other representative wells were selected because of their long monitoring records, recent monitoring, and trends that illustrate regional observed patterns.

Southern Management Area. Although the District has monitored selected wells in the Southern MA since 2001, elevation data remain limited throughout the MA. Due to topography and groundwater flow direction, water levels in the Southern MA are about 400 ft higher than those in the Hollister MA, about nine miles away. Well 14-7-20K shows that water levels reached a local maximum during 2006, decreased to a local minimum during the drought in 2013-2015, and recovered through 2019. In 2020 groundwater levels decreased slightly, but the decrease is within the range of normal fluctuations for this well. In general, the water level trend observed in 14-7-20K is similar to that of other MAs.

Hollister Management Area. The hydrograph for well 12-5-23A20 exemplifies the general groundwater level trend in the Hollister MA. This well showed relatively low groundwater levels during the 1970s (before CVP), followed by a steady increase to local high elevations in 2006. Water elevations have remained somewhat steady since that time. A small decrease was observed during the most recent drought (2013-2015). Water levels in 2020 have maintained this generally steady trend. Well 13-6-19K1 in Tres Pinos subbasin shows a similar but more muted pattern of recovery. Groundwater elevations have remained fairly consistent, increasing and decreasing slightly with respective wet and dry years. Due to its location, this well is influenced more by inflow from upgradient groundwater than by local pumping.

San Juan Management Area. Groundwater elevations have remained steady in the two key wells in the San Juan MA. Groundwater levels in well 12-4-26G1, in the north-central part of the basin, remained steady from 2019 to 2020. Water levels in this well decreased slightly in the most recent drought (2013-2015). While not shown in a hydrograph, groundwater levels in the southwestern San Juan MA decreased from 2019 to 2020 (see Figure 3-5). Well 12-4-17L20, near the outflow of the basin, has maintained relatively steady groundwater levels for the past 40 years.

Bolsa Management Area. The Bolsa MA includes artesian wells like 12-5-03B1. These artesian conditions are likely due to local confined conditions created by local clay layers in the northern Bolsa and Hollister MAs. Groundwater elevations increased from 1992 until about 1998, which they pressurized to above ground surface. While the groundwater pressure head above the ground surface elevation may vary in artesian wells, artesian groundwater levels are challenging to measure. Consequently, all artesian wells in the San Benito are recorded as having a groundwater elevation at ground surface elevation.

3-GROUNDWATER CONDITIONS

The District Act (see **Appendix A**) requires presentation of estimates of annual overdraft for the current water year and ensuing water year. Consistent with previous Annual Reports, this would be represented by long-term groundwater level declines with accounting for rainfall conditions and CVP imports. As of 2020, groundwater elevation trends do not indicate overdraft. Recovery following the drought indicates that overdraft is not anticipated for 2020. For future SGMA Annual Reports, groundwater elevation maps showing the seasonal high and lows for the water year will be required. A spring map showing contours in April will be added to the Annual Report and will be compared to the October maps usually included. In addition, hydrographs showing groundwater elevations and water year type are required. While the data are presented here in separate charts, the information will be combined for future reports.

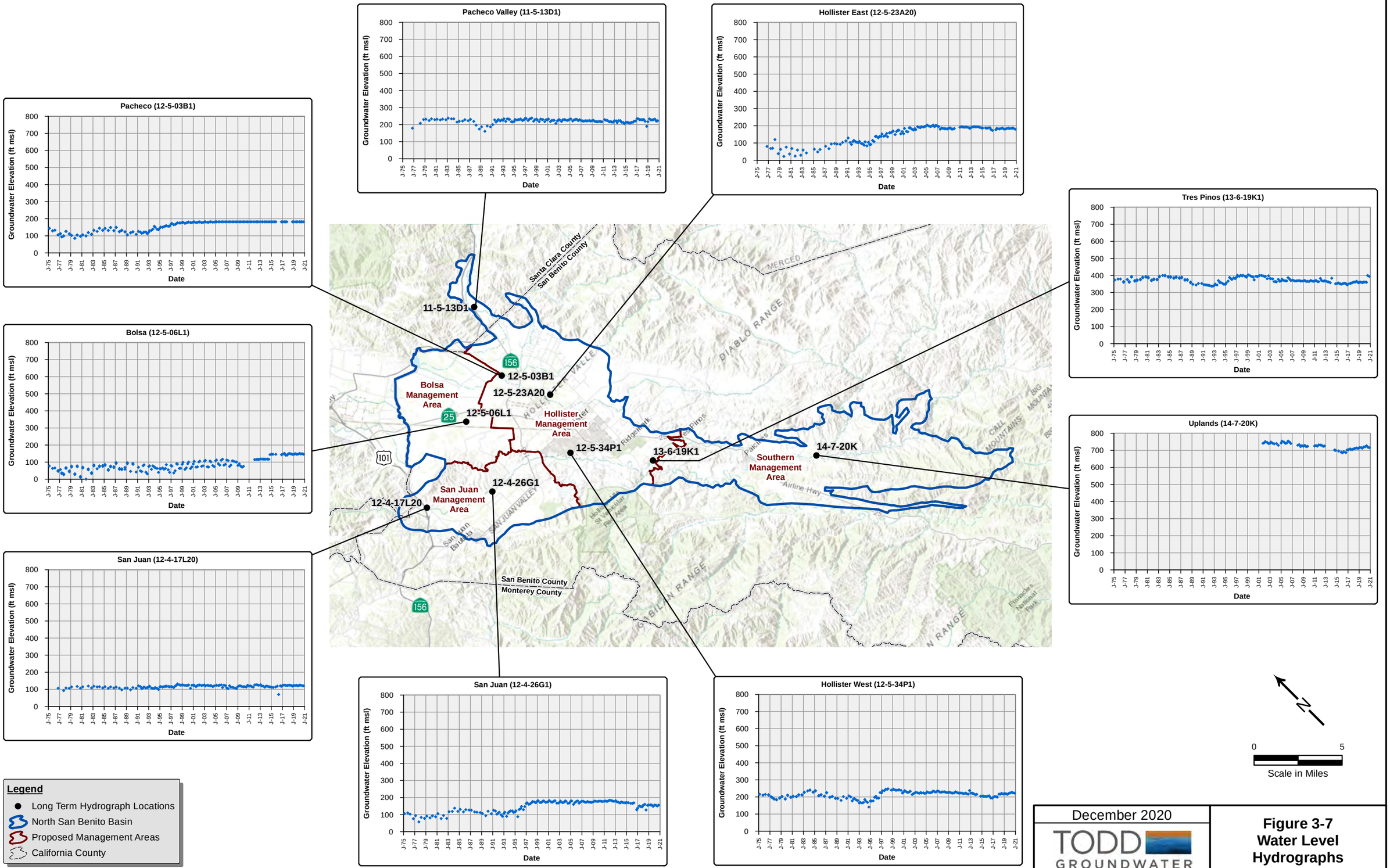


Figure 3-7
Water Level Hydrographs

4-WATER SUPPLY AND USE IN ZONE 6

Water Supply Sources

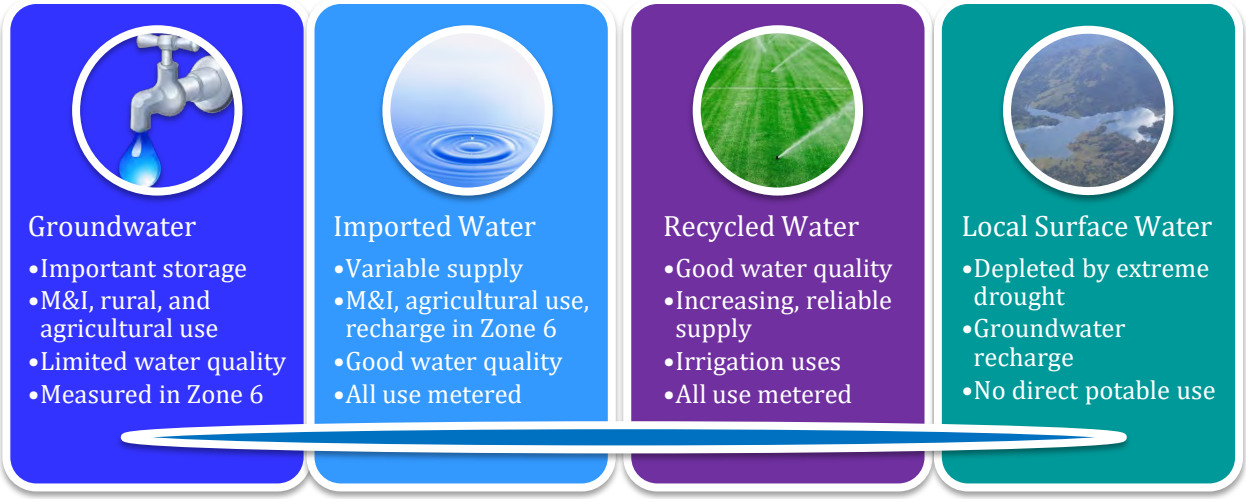
Four major sources of water supply are available for municipal, rural, and agricultural water demands in Zone 6. These are summarized below; for more data and graphs, see **Appendix E.**

Local Groundwater. Groundwater is pumped by private irrigation and domestic wells and by public water supply retailers. The District does not directly produce or sell groundwater but has the responsibility and authority to manage groundwater throughout San Benito County.

Imported Water. The District purchases Central Valley Project (CVP) water from the U.S. Bureau of Reclamation (USBR) and distributes to customers in Zone 6. Some CVP water has also been released for groundwater recharge. The District has a 40-year contract (extending to 2027 and renewable thereafter) for a maximum of 8,250 AFY of municipal and industrial (M&I) water and 35,550 AFY of agricultural water.

Recycled Water. Water recycling began in 2010 with landscape irrigation at Riverside Park. The system was expanded in 2014, including infrastructure and treatment capability for the purpose of agricultural irrigation. Recycled water currently is provided to approximately 865 acres for agricultural production and landscape irrigation. This source is reliable during drought and helps secure a sustainable water supply.

Local Surface Water. Surface water is not used directly for potable or irrigation use in the basin, but creek percolation is a significant source of groundwater recharge. In 2020, releases from the District's Hernandez and Paicines reservoirs were slightly above and slightly below average, respectively , contributing to recharge of the groundwater basin. Stormwater capture currently is limited to some diversion by the City of Hollister to the Hollister Industrial WWTP (via a combined sewer system) with subsequent treatment and discharge to percolation and evaporation ponds.



Available Imported Water

The District distributes CVP water to agricultural and M&I customers in Zone 6. The allocation of the contract for each year is variable and contingent on total available supply of the CVP system. In dry years, the allocation may be zero and in wet years, it may be 100 percent of the contract amount. The USBR contract years are March through February, so Water Year 2020 (Oct 2019-Sept 2020) overlapped two contract years. The above-average hydrological conditions of last year resulted in increased allocations for the March 2019-February 2020 contract year but the below-average hydrological conditions of the current water resulted in relatively low allocations. **Table 4-1** shows the contract entitlements and recent allocations for both USBR contract years that overlap Water Year 2020 (SLDMWA 2020).

As shown in **Table 4-1**, USBR contract year 2019 (March 2019 - February 2020) allocations were 75 percent and 100 percent for agricultural users and M&I users respectively. For USBR contract year 2020 (March 2020 - February 2021), allocations were 20 percent and 70 percent for agricultural users and M&I users, respectively. While both years were above the average allocations for municipal users, the current water year was less than the average allocation of agricultural uses; for the last ten years (2011-2020), the average allocations were 39 percent and 66 percent for agricultural users and M&I users respectively.

Table 4-1. Allocation for USBR Water Years 2019-2020

March 2019 - February 2020

	Contract	% Allocation	Allocation Volume (AF)
Agriculture	35,550	75%	26,663
M&I	8,250	100%	8,250
TOTAL	43,800		34,913

March 2020 - February 2021

	Contract	% Allocation	Allocation Volume (AF)
Agriculture	35,550	20%	7,110
M&I	8,250	70%	5,775
TOTAL	43,800		12,885

Reported Water Use

Table 4-2 shows the total reported water use in Zone 6 by source and user type for Water Years 2019 and 2020. Municipal use is metered. Agricultural CVP water use is recorded and agricultural groundwater use in Zone 6 is estimated using power meters. Independent estimates of total groundwater pumping based on crop type and irrigation rates generally indicate more groundwater use than is reported by the meters. At this time, the Annual Groundwater Report continues to use the reported water use to allow for consistency of analysis from year to year. The District is currently developing a program that will accurately estimate groundwater use over the entire basin area. Future SGMA annual reports will provide an assessment of pumping in Zone 6 and throughout the basin.

In Water Year 2020, total water use increased slightly (10 percent) from 2019, consistent with the five-year average. Reported water use increased for all user types and most water sources. However, recycled water use decreased 8 percent, slowing the growth of this new water source that has been occurring over the last four years.

Figure 4-1 shows Zone 6 reported water use by source since 1988. Overall, the graph indicates that water use since 2008 has remained steady with the exception of higher than normal water use in 2013 and 2018. The average total water use from 2008 to 2020 was 39,000 AFY; in the preceding period of the same length 1995-2007, the average water use was 45,000 AFY, reflecting 15 percent less water use in recent times. The reduction in water use may be the result of a combination of reduced supply of CVP imported during dry conditions, changes in crops and irrigation practices, and/or improved water conservation. Water conservation efforts that began during the 2013-2016 drought continue to moderate water use in the basin. The graph also shows the general balance between CVP and groundwater use; groundwater represented a large portion of the supply during the drought and following year when CVP water was curtailed. Since 2000, CVP supply has represented 14 to 54 percent of supply largely controlled by the allocation for agricultural users; allocations have ranged from 0 to 100 percent of contract over this period. In Water Year 2020, groundwater was 54 percent of the total reported water use, CVP represented 45 percent of supply, and recycled water was 1 percent.

Figure 4-2 illustrates the use of groundwater and CVP supply by user type in Zone 6. Groundwater use is shown in green. The darker green represents agricultural water use and the lighter green represents domestic and municipal use. Similarly, CVP use is shown in blue – where light blue is agricultural use and dark blue is domestic and municipal. While total water use has remained fairly stable, the portion served by groundwater varies based on CVP allocations. On **Figure 4-2,** this can be seen during the 2013-2016 period when CVP allocations were minimal and groundwater use increased. In recent years, municipal demand has transitioned. Historically municipal demand was satisfied totally by groundwater and currently more than half is served by CVP; this is due to expansion of treatment capacity for CVP municipal use with the Lessalt and West Hills Treatment Plants. In Water Year 2020, 58 percent of municipal supply was served by CVP imports.

Table 4-2. Total Water Use in Zone 6 by User and Water Source 2019-2020

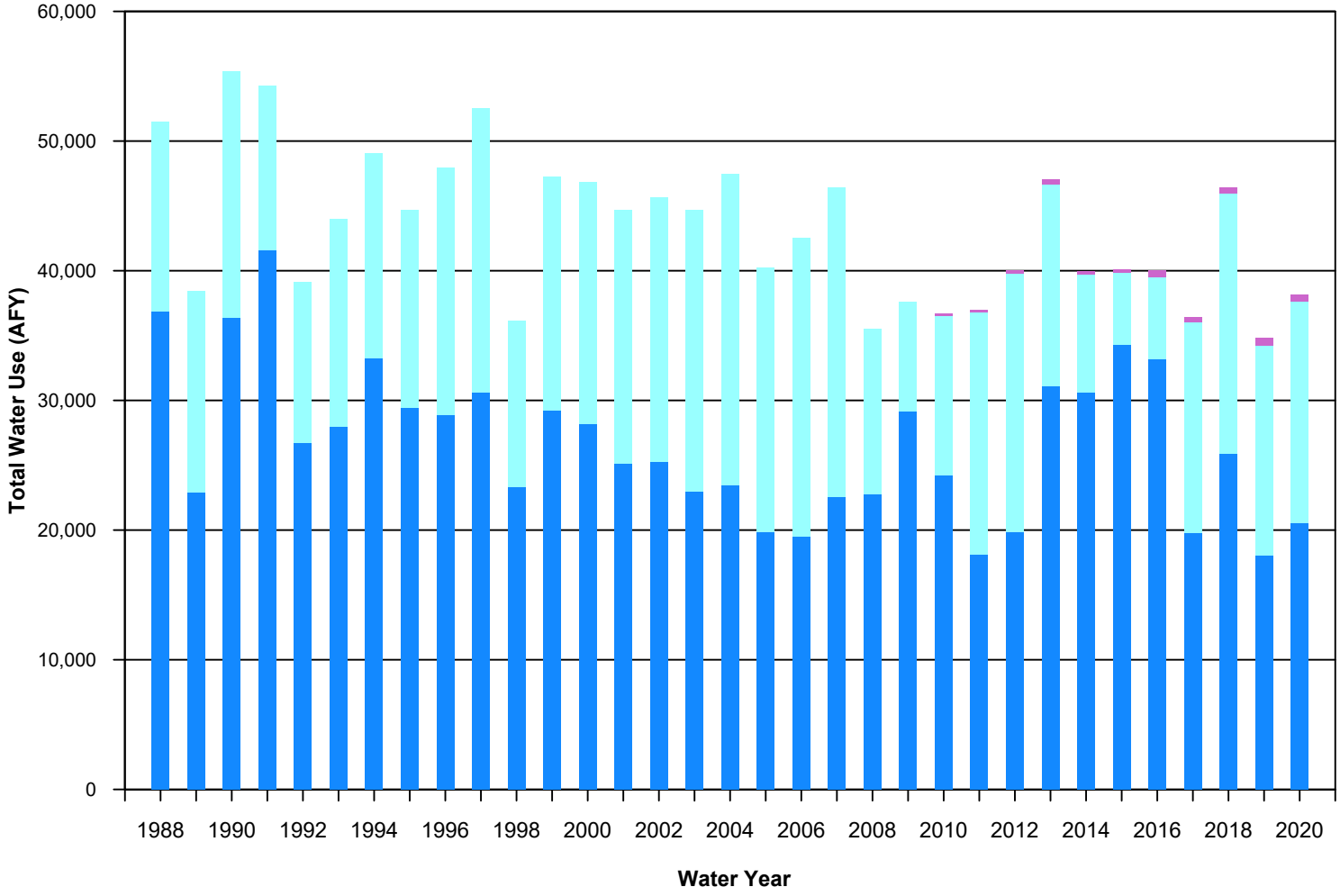
	CVP		GW		RW		Total	
	2019	2020	2019	2020	2019	2020	2019	2020
Agriculture	11,731	12,166	15,423	17,021	461	428	27,616	29,616
M&I	4,457	4,953	2,660	3,514	108	97	7,225	8,565
TOTAL	**16,188**	**17,119**	**18,083**	**20,536**	**569**	**526**	**34,841**	**38,181**

Table 4-3 shows the breakdown of total water use by each subbasin (and management area) in Zone 6. Consistent with past patterns, San Juan is the largest producer of groundwater and the second largest user of CVP supplies, mainly for agricultural irrigation. Hollister East is the largest user of CVP for both agricultural users and municipal uses, reflecting extensive agriculture and the expanded municipal water treatment capacity.

Table 4-3. Zone 6 Water Use by User and Water Source 2019-2020

Management Area	Subbasin	CVP Water		Groundwater		Recycled Water	
		Agriculture	Domestic & Municipal	Agriculture	Domestic & Municipal	Agriculture	Domestic & Municipal
Hollister	Bolsa South East	391	0	2,083	9	21	0
	Hollister East[1]	5,924	3,766	3,527	475	0	0
	Hollister West	263	24	1,475	965	407	97
	Tres Pinos	121	91	249	1,147	0	0
	Pacheco	1,867	56	2,725	425	0	0
San Juan	San Juan	3,602	1,017	6961	493	0	0
TOTAL		**12,166**	**4,953**	**17,021**	**3,514**	**428**	**97**

1. Hollister East includes 1,990 AF of CVP water delivered to the West Hills Treatment Plant in San Juan but supplied to Hollister East customers.



Recycled Water
CVP
Groundwater

December 2020

TODD GROUNDWATER

Figure 4-1
Total Water Use by Source and Use 1988-2020 (AFY)

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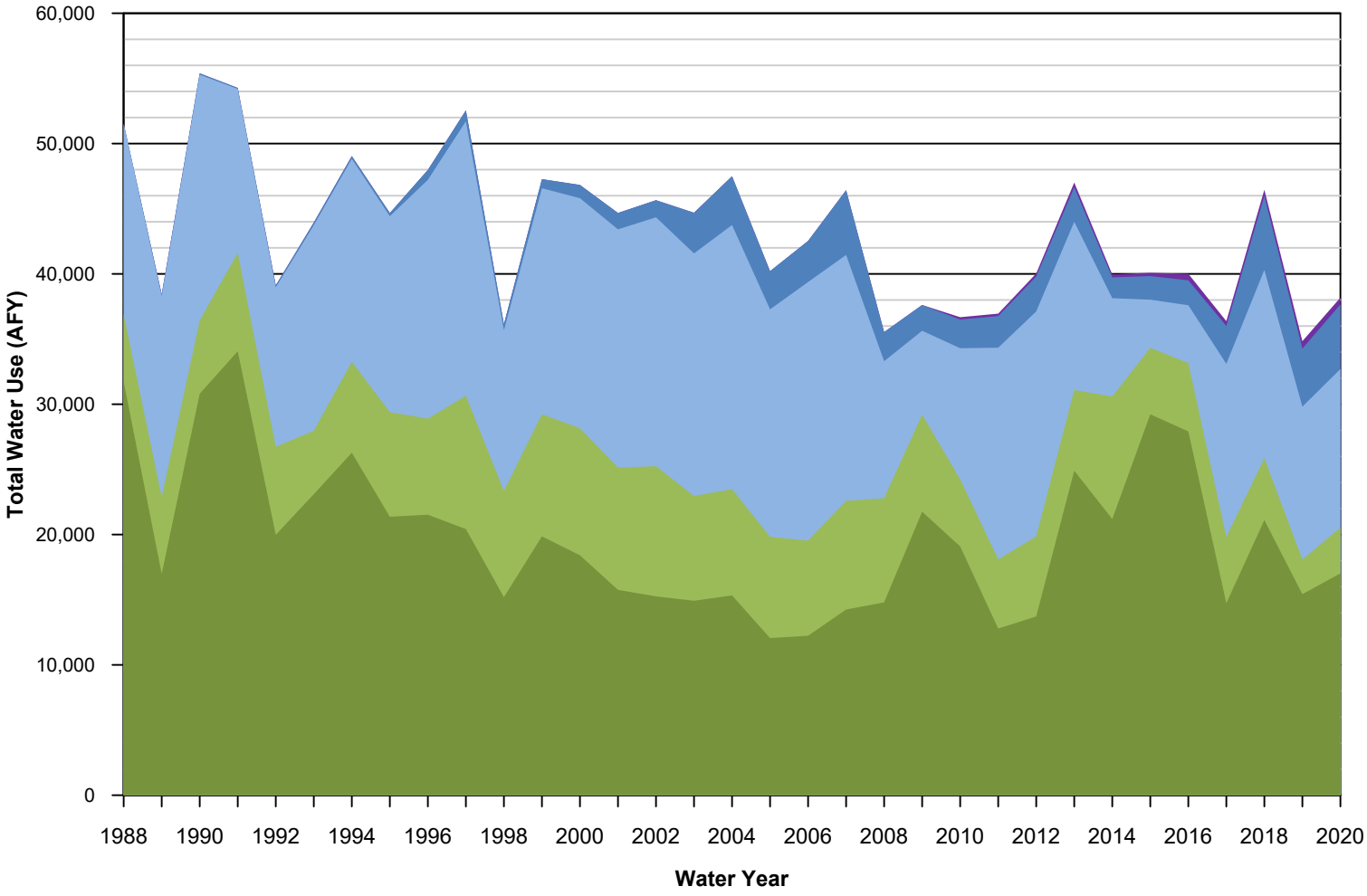

Recycled Water
CVP Domestic & Municipal
CVP Agricultural
Groundwater Domestic & Municipal
Groundwater Agriculture

December 2020

TODD GROUNDWATER

Figure 4-2
Groundwater and CVP supply in Zone 6

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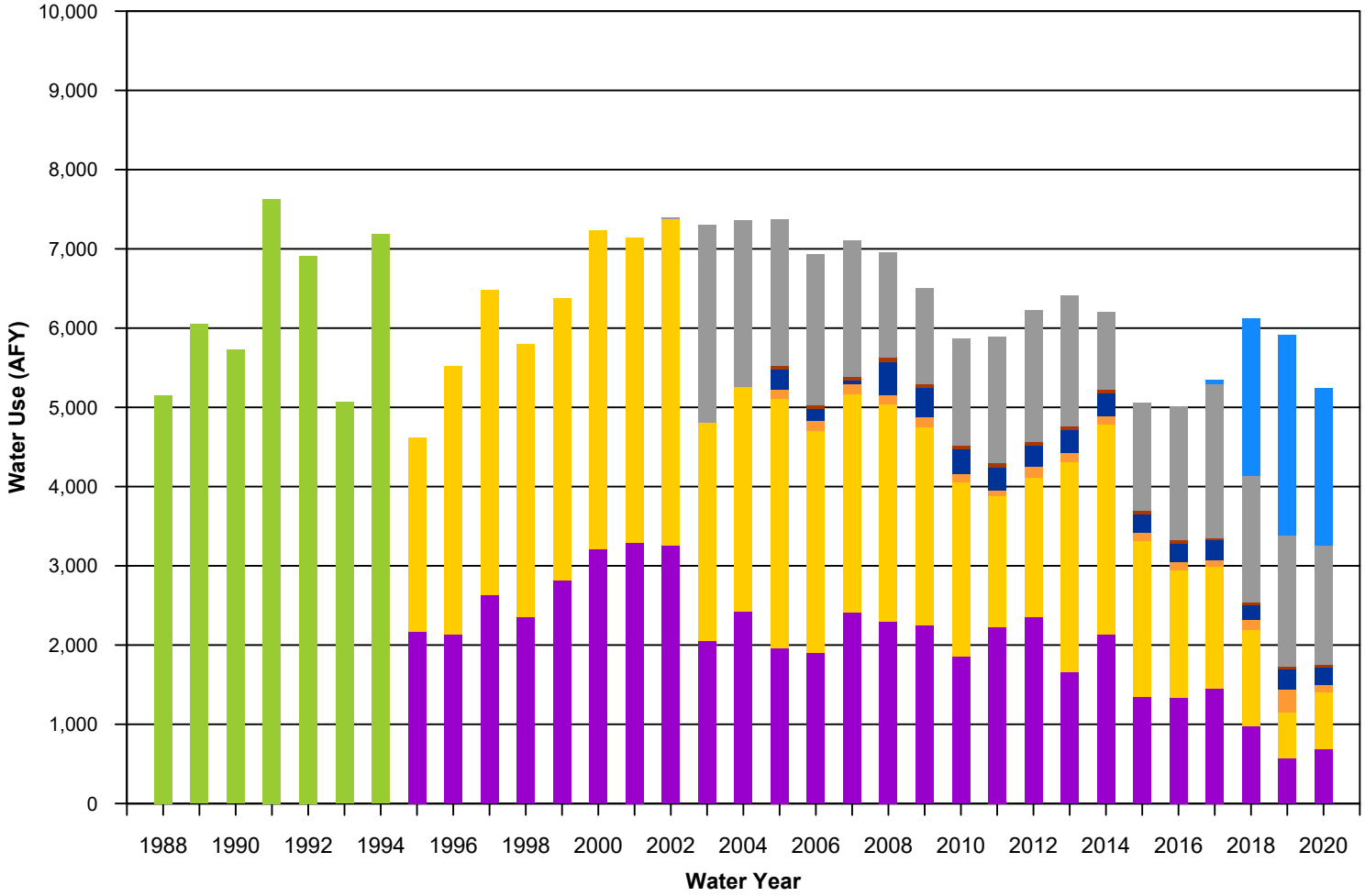
Figure 4-3 shows the municipal water supply for the City of Hollister, SSCWD, San Juan Bautista, and Tres Pinos County Water District. While historical data are not readily available for the Tres Pinos CWD, Cienega, and San Juan Bautista wells, municipal demand was satisfied entirely by groundwater prior to 2003. The completion of Lessalt Water Treatment Plant (WTP) in 2003, the expansion of Lessalt in 2016, and the completion of West Hills WTP in 2018 have significantly increased the use of CVP water for the Hollister and SSCWD municipal systems. In **Figure 4-3**, annual water supply provided through the Lessalt WTP is shown in grey and West Hills WTP in dark blue. In 2020, these two treatment plants served about 67 percent of the M&I supply, a slight decrease from last water year. This ability to maximize CVP use will increase flexibility for local water users to use groundwater or CVP. It also provides better quality water for delivery to municipal customers and result in improved wastewater quality, which supports water recycling.



City of Hollister - GW Wells
San Juan Bautista Wells
Lessalt Water Treatment Plant
Undivided Total
Sunnyslope CWD Wells
City of Hollister - Cienega Wells
Tres Pinos CWD Well
West Hills Water Treatment Plant

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Figure 4-3
Water Use in Zone 6 by Source

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5-WATER MANAGEMENT ACTIVITIES

District water management activities include comprehensive monitoring (summarized in Section 2) and importation and distribution of CVP water in Zone 6 (Section 4). In addition, the District provides water resources planning, water conservation support services, and managed percolation of local surface water to augment groundwater; these are summarized in this section. Sources of revenue to support District operations also are presented here.

Water Resources Planning

The District has used multiple planning efforts to support groundwater sustainability. These have included water management plans such as the Groundwater Management Plan (1998 and 2003), Integrated Regional Water Management Plan (2007) and subsequent updates, Salt and Nutrient Management Plan (2014), Agricultural Water Management Plan (2015), and Urban Water Management Plans (2016). These plans have addressed a range of groundwater sustainability issues with advancement of water conservation, protection of water quality, and conjunctive use of imported water, local surface water, recycled water and groundwater. Current efforts and recent accomplishments are summarized below.

Hollister Urban Area Water Project. This project is an ongoing collaborative effort with local agencies to provide a secure and stable water supply to the region. The project has involved provision of water treatment for CVP water, which allows its direct use for municipal and industrial (M&I) purposes. It also allows delivery of improved quality water to customers. 2020 continues to see the beneficial effects of the new West Hills WTP and newly expanded Lessalt WTP. The District also has worked cooperatively for years with the City of Hollister to implement recycled water use primarily for agricultural irrigation, which is expected to increase in coming years.

Urban Water Management Plan (UWMP). The District, in collaboration with Sunnyslope County Water District (SSCWD) and the City of Hollister, has begun the 2020 Urban Water Management Plan (UWMP) that will be submitted to DWR by the July 2021 deadline. The UWMP provides detailed information on the current and future water supply and demand for the Hollister Urban Area and provides a comparison of supply and demand in normal years plus single-year and multi-year droughts. The UWMP will dovetail with the 2020 Agricultural Water Management Plan and the GSP to provide a framework of strong water management.

Recycled Water

Water recycling began with targeted municipal irrigation. The system was expanded in 2014, including infrastructure and treatment capability to improve water quality for the purpose of agricultural irrigation. The system was further improved in 2015 when SBCWD installed 1.65 miles of additional distribution system piping and 30 metered deliveries to provide water for agricultural customers for approximately $1,000,000. In 2016, the Recycled Water Storage Pond was installed in "Pond 2" at the Domestic Waste Reclamation Facility (DWRF) to improve distribution system water quality and be able to store surplus supply during high agricultural demand periods when the DWRF is not producing enough recycled water. Last year in 2019, SBCWD installed a series of sand media filters upstream of the Recycled Water Distribution System to improve water quality to allow agricultural customers the ability to use drip irrigation and minimize backwash waste. These upgrades to the Recycled Water Storage Pond and distribution system cost approximately $1,500,000. Recycled water currently is provided to approximately 865 acres for agricultural production and landscape irrigation.

Water Conservation

Water conservation is an important tool to manage demands on the groundwater basin particularly during drought. Water conservation efforts in San Benito County are conducted through the Water Resources Association (WRA). WRA is a cooperative effort among the District, City of Hollister, City of San Juan Bautista, and Sunnyslope County Water District.

In Water Year 2020, the COVID-19 pandemic altered the programs offered by the WRASBC. Most active programs were put on hold March through May but WRA staff continued to reach out via phone and video calls. Since May, field programs have resumed, including irrigation system checks and water softener replacement assistance. These programs have been altered to meet all safety measures including social distancing and masks for all participants. Indoor programs such as residential water use surveys have not restarted.

The public education program had been growing steadily over the past several years. The in-person program, which included school visits and guided field trips, is temporarily suspended due to COVID-19 but will resume when appropriate. However, WRA staff have continued to find creative ways to continue the program. In partnership with the school district, water conservation activity books were distributed to elementary to offer additional enrichment during distance learning. The WRA staff is also pursuing additional education activities including virtual tours of the water treatment and wastewater plants for students.

Public outreach has also shifted to virtual platforms. WRA staff continues to author news articles for the online news sites that serve San Benito County. In March, these articles allowed WRA to quell public concern over the safety of our water supply. Later, the articles provided water conservation and

efficiency tips that were seasonal in nature and they continue to provide timely advice for water use. To supplement this effort, the WRA is developing a series of water conservation videos for distribution to the local news media and the newly updated WRA website.

WRA has been monitoring changes in water use sectors due to the COVID-19 response. With more residential water use and less water use in the agricultural and business sector, they are focusing their conservation message to residential customers. This focus extends to new residential development in the City. WRA reviews landscape plans for the City of Hollister to make sure that new homes comply with the State's Model Water Efficient Landscape Ordinance (MWELO) and follows up with a post inspection after the landscape materials are installed to ensure the landscape plans were followed.

Finally, WRA continues to provide various rebates (toilets, landscape hardware, etc.). The most popular rebate program is the water softener demolishing/replacement program. With provision of CVP supply for municipal use, the delivered water quality has improved, and customers are willing to abandon unneeded water softeners. This program has the benefit of improving the water quality of municipal wastewater and recycled water.

Managed Percolation

Percolation of Local Surface Water. In most years, local surface water released from Hernandez and Paicines reservoirs is percolated along the San Benito River and Tres Pinos Creek. Releases are managed to maximize percolation along the stream channels of the San Benito River and Tres Pinos Creek and to avoid any losses out of the basin. Hernandez Reservoir releases in 2020 were slightly below average (reflecting the below normal rainfall), amounting to 9,473 AF. Releases from Paicines were 2,037 AF, slightly above average.

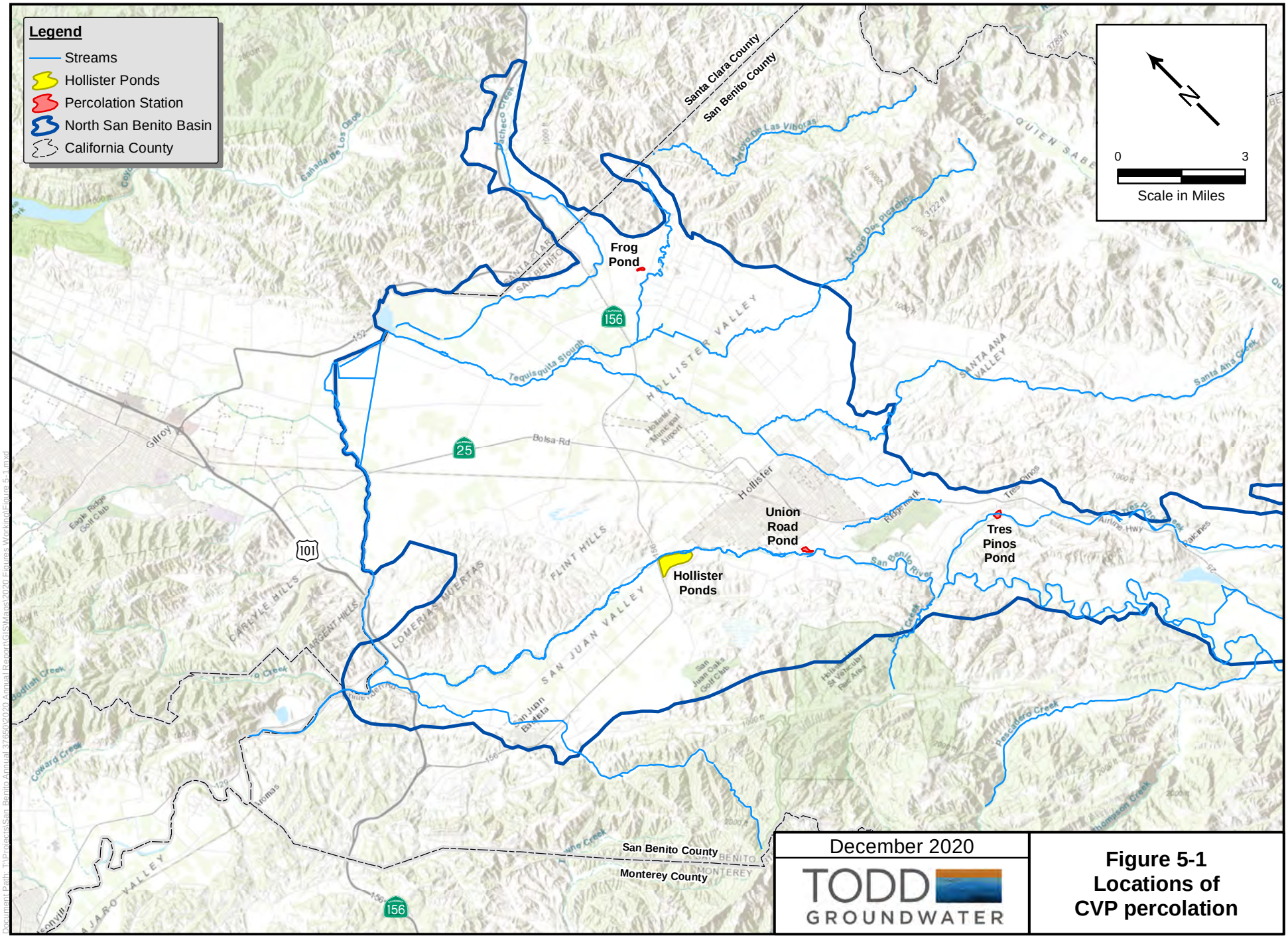
Percolation of Wastewater. Wastewater is percolated by the City of Hollister at its Domestic and Industrial plants, by SSCWD at its Ridgemark Facilities, and by Tres Pinos County Water District. While the City of San Juan Bautista wastewater treatment plant also discharges wastewater, the flows are not considered to percolate to the groundwater basin because of the local hydrogeologic conditions. Recent changes in operation of the wastewater facilities (including increased water recycling) and decreased municipal water use have decreased the volume percolating to the groundwater. Information about the amount of groundwater recharged from wastewater facilities is found in **Appendix D**.

Percolation of CVP Water. In Water Year 2020, the District percolated 3,161 AF of CVP water in four dedicated off-stream basins; locations are shown in **Figure 5-1. Figure 5-2** shows the volume of CVP recharge by major water way over time. The managed recharge of the imported water was critical in replenishing the basin in the 1980s and 1990s; however, the threat of zebra mussel contamination and low CVP allocations prevented the practice from 2008 to 2016. The District has resumed recharge at dedicated basins adjacent to streams.

Financial Information

The District derives its operating revenue from charges levied on landowners and water users. Non-operating revenue is generated from property taxes, interest, standby and availability charges, and grants. District zones of benefit are listed in **Appendix A**. Zone 6 charges, relating to the importation and distribution of CVP water, are the focus of this section.

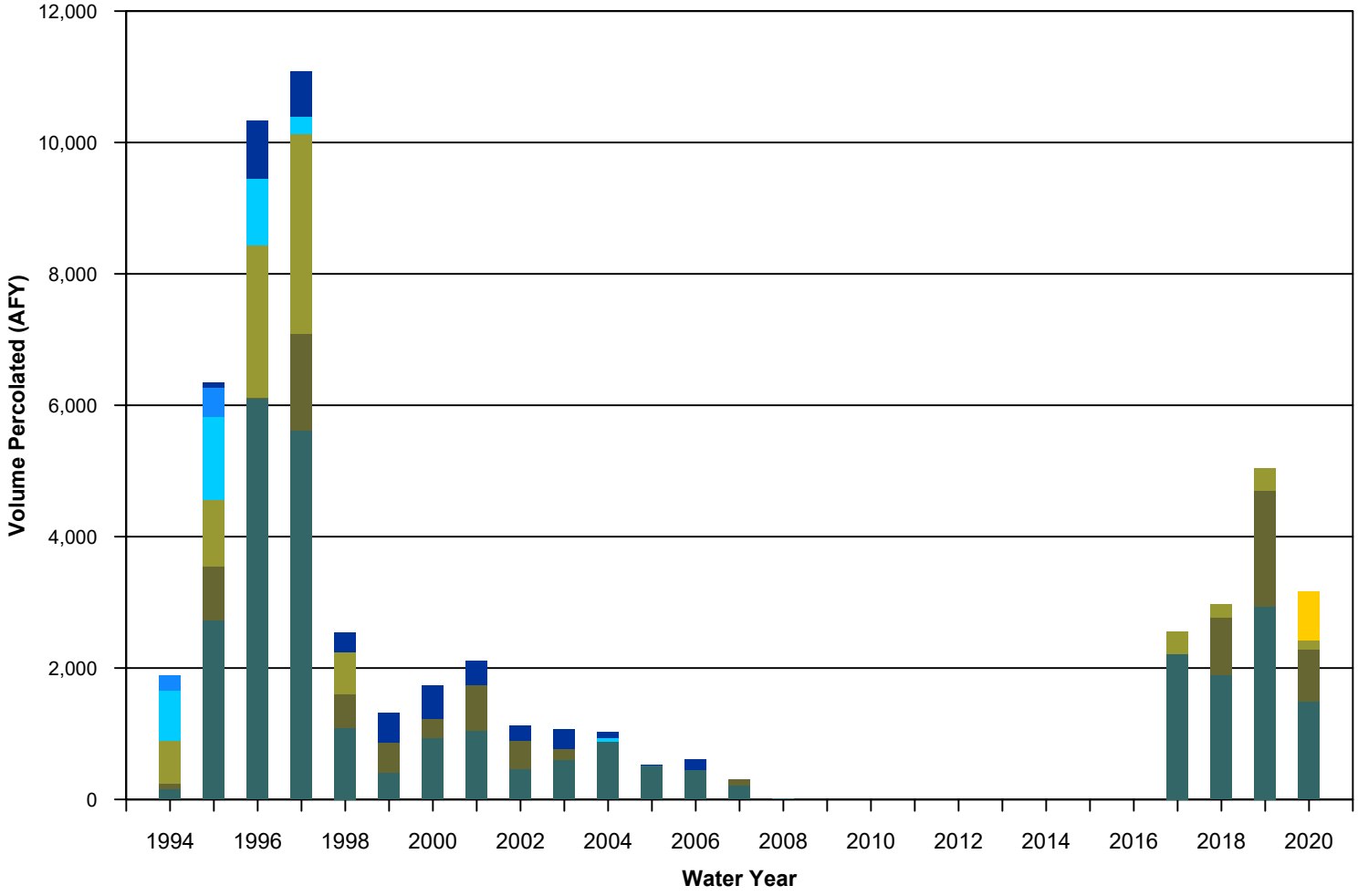
Table 5-1 presents the groundwater charges for Zone 6 water users, which reflect costs associated with monitoring and management. A full worksheet of how groundwater charges are determined can be found in **Appendix F**. Groundwater charges are adjusted annually in March. For March 2020 – February 2021, District rates are $13.15 for agricultural use and $39.40 for M&I use. The District adopts rates on a three-year cycle. Current water rates were adopted January 30, 2019.



December 2020

TODD GROUNDWATER

Figure 5-1
Locations of CVP percolation



- San Benito River
- Tres Pinos Creek
- Arroyo de las Viboras
- Arroyo Dos Picachos
- Pacheco Creek
- Santa Ana Creek
- Hollister Ponds

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TODD GROUNDWATER

Figure 5-2
Volume of Percolation

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Table 5-1. Adopted Groundwater Charges

Year	Agriculture ($/AF)	M&I ($/AF)
2020-2021	$13.15	$39.40
2021-2022	$13.55	$40.55

CVP rates (provided by the USBR) include the cost of service, restoration fund payment, charges for maintenance of San Luis Delta Mendota Water Authority facilities, and other fees (the breakdown is found in **Appendix F**). The District's blue valve rates (paid by users of CVP water) include a water charge and a power charge. Additionally, the standby and availability charge is a $6 per-acre charge assessed on all parcels with access to CVP water (an active or idle turnout from the distribution system). **Table 5-2** shows the CVP water charge and **Table 5-3** shows the CVP power charge.

Table 5-2. Adopted Blue Valve Water Charges

	Blue Valve Water Charge ($/AF)			
		Agricultural		
Year	Non - Full Cost	Full Cost (1a)	Full Cost (1b)	Municipal & Industrial
2020-2021	$265.00	$400.00	$421.00	$415.00
2021-2022	$274.00	$411.00	$433.00	$424.00

Table 5-3. Adopted Blue Valve Power Charges

Blue Valve Power Charge ($/AF)	Subsystem 2	Subsystem 6H	Subsystem 9L	Subsystem 9H	All other subsystems
2020-2021	$82.85	$40.45	$90.80	$134.20	$34.75
2021-2022	$85.35	$41.50	$93.55	$138.25	$35.75

Recycled water charges (**Table 5-4**) are set to recover current operating and maintenance costs related to the water service. Recycled water rates include those associated with water supply, water quality, and infrastructure.

Table 5-4. Adopted Recycled Water Charges

	Recycled Water ($/AF)	
Effective	Agriculture Rate	Power Charge
Apr-2020	$208	$60.64
Mar-2021	$210	$61.85

6-GROUNDWATER SUSTAINABILITY

Sustainable Groundwater Management Act (SGMA)

The Sustainable Groundwater Management Act (SGMA) requires sustainable management of priority groundwater basins and empowers local Groundwater Sustainability Agencies (GSAs) to manage groundwater resources. San Benito County Water District GSA (SBCWD GSA), in partnership with Santa Clara Valley Water District GSA (SCVWD GSA) for small portions of the basin in Santa Clara County, is developing a Groundwater Sustainability Plan (GSP) for the North San Benito Basin, which encompasses the historically-defined Bolsa, Hollister, and San Juan Bautista Subbasins of the Gilroy-Hollister Basin and the Tres Pinos Valley Basin. This GSP is currently being developed and several chapters are posted on the GSA website for public comment. **Figure 1-1** shows the GSP area, which is mostly in San Benito County with small portions extending into Santa Clara County.

Groundwater Sustainability Plan Development

The District began GSP development in 2018 and several draft plan sections are already available to the public through the District's website: https://www.sbcwd.com/sustainable-groundwater-management/. These following draft sections of the initial GSP are posted on the website:

Plan Area/Institutional Setting. The first two sections of the GSP, Introduction and Plan Area, describe the North San Benito Basin and the institutional setting.

Hydrogeologic Conceptual Model/Groundwater Conditions. The hydrogeologic conceptual model is a description of the structural and physical characteristics that govern groundwater occurrence, flow, storage, and quality. The Groundwater Conditions section documents historical and current groundwater conditions including groundwater levels and flow, groundwater quality, land subsidence, and interactions of groundwater and surface water.

Water Budgets. The water budget section quantifies the surface water and groundwater inflows, outflows, and change in storage. The section also includes a brief description of the numerical model. The technical memorandum describing the model is also available on the District's website.

Sustainability Criteria. The GSP addresses the five undesirable results/sustainability indicators relevant to North San Benito Basin. These include: chronic lowering of groundwater levels, groundwater storage depletion, water quality degradation, land subsidence, and depletion of interconnected surface water. For each, systematic quantification is presented of the undesirable results, minimum thresholds, and measurable objectives to guide GSP implementation.

The following two sections currently are in development and will be presented to the Technical Advisory Committee (TAC) and made available to the public in early 2021.

Monitoring. This GSP section establishes the GSP monitoring network and protocols that: 1) provide data to inform the hydrogeologic conceptual model, water budget and numerical model, 2) provide tracking and early warning regarding groundwater conditions and undesirable results, and 3) demonstrate progress toward and achievement of sustainability.

Management Actions. This GSP section will present management actions—policies, programs, and projects—that address the sustainability criteria and provide for sustainable management into the future.

Amendment for GSP Preparation, Round 3 Tasks

In 2019, SBCWD GSA applied to DWR for additional grant funding as part of the 2019 Sustainable Groundwater Management Grant Program Planning – Round 3 Grant and in 2020 was awarded $1.17 million in grant funds. With SBCWD GSA cost sharing of $390,000, the total Round 3 project cost is $1.56 million. The Round 3 project, entitled Reaching Sustainability: Dedicated Monitoring Wells and Managed Aquifer Recharge for North San Benito Basin, was initiated in June 2020. In addition to project administration, it involves three technical tasks:

- Dedicated Monitoring Well Program
- Managed Aquifer Recharge (MAR)
- Annual Reports

These tasks, summarized below, are intended to supplement GSP preparation and to occur within the overall GSP schedule (with submittal of the GSP in January 2022).

Dedicated Monitoring Well Program

Additional collection of hydrogeologic data and new dedicated monitoring wells are needed for GSP preparation and implementation. This reflects the expanded area of the new North San Benito Basin, an area larger than previously monitored, especially in the Southern Management Area. In addition, specific data gaps and uncertainties have been identified during preparation of GSP chapters. Objectives for siting new dedicated monitoring wells are to fill gaps in the existing monitoring network and provide a groundwater monitoring framework to support GSP implementation.

Achieving these objectives has required detailed analysis including development and implementation of a geographically based index overlay methodology. This indexed overlay method has included development of GIS datasets and subsequent mapping of these datasets together to find locations that fill multiple data gaps. As needed, the relative priorities of various data needs have been assessed qualitatively with input from District staff. This process has identified areas for the installation of both

deep and shallow monitoring wells. The areas identified for deep monitoring wells have been delineated on an parcel basis, and at time of writing, District staff are contacting property owners of these parcels to identify owners willing to have a monitoring well installed on their property. The areas identified for shallow monitoring wells are primarily within public rights of way, and the District is working to secure access to those locations for the installation of shallow wells for monitoring of interconnected surface water. Next steps include preparation of well designs, drilling and construction of the monitoring wells, and preparation of a technical memorandum documenting the work.

Managed Aquifer Recharge Study

This study addresses questions of how additional MAR can be achieved in North San Benito: where, which method, what water source and when, and how much benefit can be gained. Unlike some basins with highly permeable alluvial fans and recharge forebays, the most useful recharge areas in the North San Benito Subbasin may not be obvious. Moreover, the best areas are likely to represent the sum of many various factors. Hence a systematic and precise analysis of geographically distributed recharge factors is provided in this study along with field exploration to provide subsurface documentation of site suitability. At time of writing, substantial information has been compiled relevant to MAR and spatial datasets have been developed for factors including land use, topography, soils, geology, depth to groundwater, groundwater quality, and water supply infrastructure. Three basic methods have been identified: recharge basins, injection wells, and FloodMAR or AgMAR, which involve application of floodwater or available surface water supply to farmland (water spreading). Potential sources of recharge supply have been evaluated and CVP water has been identified as the primary source. The spatial database has been used to identify promising areas for recharge. At time of writing, a short list of promising sites is being developed field investigation (soil borings) and numerical modeling. Next steps involve selection of most promising sites for conceptual design, technical feasibility, and cost estimating, followed by preparation of a technical memorandum.

2020 and 2021 Annual Reports

This task involves preparation of the 2020 and 2021 Annual Reports and presentation to the SBCWD Board of Directors. This will involve transitioning Annual Reports, prepared consistent with requirements of the San Benito County Water District Act, to satisfy SGMA requirements in addition to SBCWD requirements. These Annual Reports will summarize GSP progress, including the Dedicated Monitoring Well Program and MAR study.

Future Annual Reports

When the GSP is completed (before January 31, 2022) the GSP implementation process will continue with annual reporting and with five-year updates. SBCWD has been preparing Annual Groundwater Reports for many decades consistent with the District Act (see **Appendix A**) and future Annual Reports will be revised to be responsive to SGMA and GSP Regulations. SGMA Annual Reports have specific requirements that include documentation of groundwater levels and storage change and reporting of basin-wide groundwater extraction.

Several elements are required by GSP Regulation and already are included in the District's Annual Reports, including:

- Monitoring data stored in a Data Management System
- General information, including an executive summery and location map
- Detailed description and graphical representation of groundwater levels (contours and hydrographs)
- Surface water supply by use

GSP regulations require future annual reports to include additional information and to address the entire North San Benito Basin:

- Detailed description and graphical representation of groundwater use.
- Groundwater extractions and a map that illustrates general location and volume.
- Total water use for the basin collected by the best available measurement methods reported by sector.
- Change in storage maps for the basin and cumulative change in storage for the basin. While this is currently provided in the Annual Report for the northern portion of the basin, the analysis must be extended to the entire basin. Consistent with the GSP under preparation, the numerical model will be used to calculate and present change in storage values.
- Description of progress towards implanting the plan.

The Annual SGMA Reports will serve as a bridge between the GSP being developed now and the first 5-year update in 2027. The Annual Reports will describe progress in implementing the plan, including monitoring programs, management actions, and projects. Groundwater basin conditions will be described in terms of the sustainability indicators (undesirable results) and with reference to the sustainability criteria including the minimum threshold and measurable objectives defined in the GSP. The table below summarizes the indicators and indicates briefly how the annual report will provide status updates.

Table 6-1. SGMA Indicators in Future Annual Reports

	Indicator	Status of Minimum Threshold
	Groundwater-Level Declines	Compile water level data. Compare key wells elevations with MTs
	Groundwater-Storage Reductions	Compute groundwater storage using the numerical model.
	Water-Quality Degradation	Compile water quality data. Summarize the findings for the triennal review.
	Land Subsidence	Download and review DWR InSar data
	Interconnected Surface-Water Depletions	Review key shallow wells elevations with MTs

7-RECOMMENDATIONS

District policies and programs have served to effectively manage water resources for many years. The District, working collaboratively with other agencies, has eliminated historical overdraft through importation of CVP water, has developed and managed multiple sources of supply to address drought, has established an active and effective water conservation program, has initiated programs to protect water quality, and has improved delivered water quality to many municipal customers. The District also has provided consistent reporting and outreach. The following recommendations are responsive to the District Act and look forward to continuing effective management consistent with SGMA.

Monitoring Programs

Through GSP implementation, the monitoring programs will be expanded to the entire North San Benito Groundwater Basin and improved to ensure accurate and consistent data for GSP management and the Annual Reports. Detailed monitoring recommendations are being developed as part of the GSP. As summarized here, the Round 3 Dedicated Monitoring Program is being conducted to provide a framework of dedicated monitoring wells to support documentation of groundwater levels, storage, and quality in the Annual Reports and GSP. Accurate measurement of groundwater pumping has been identified as an important data gap and GSP preparation includes consideration of different methods to evaluate groundwater pumping. SGMA Annual Reports will need to document groundwater extraction for the entire basin.

Groundwater Production and Replenishment

Past District percolation operations helped to reverse historical overdraft and then accumulate a water supply reserve. The District currently manages groundwater storage and surface water to minimize excessively high or low groundwater elevations on a temporal and geographic basis. The District should continue to operate Hernandez and Paicines to improve downstream groundwater conditions. In 2020, the District provided off-channel percolation of CVP water; this too should be continued given availability of CVP water and persistence of local low groundwater levels. Basin-wide analysis of opportunities for additional percolation is being conducted as part of the Round 3 Managed Aquifer Recharge Study to develop additional percolation capacity to capture and store available imported water when available; such replenishment operations are critical to sustainable groundwater supply.

Groundwater Charges

The groundwater charge for the USBR contract year (March 2021-February 2022) is recommended to be $13.55 per AF for agricultural use in Zone 6 and a groundwater charge of $40.55 per AF is recommended for M&I use The District adopts rates on a three-year cycle. Current water rates were adopted January 30, 2019.

8-REFERENCES

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List of Tables

Table A-1. District Zones of Benefit

Table A-2. Special Topics in Previous Annual Reports

APPENDIX A REPORTING REQUIREMENTS

The San Benito County Water District Act (1953) is codified in California Water Code Appendix 70. Section 70-7.6 authorizes the District Board of Directors to require the District to prepare an annual groundwater report; this report addresses groundwater conditions of the District and its zones of benefit (**Table A-1**) for the water year, which begins October 1 of the preceding calendar year and ends September 30 of the current calendar year. The Board has consistently ordered preparation of Annual Reports, and the reports have included the contents specified Section 70-7.6:

- An estimate of the annual overdraft for the current water year and for the ensuing water year
- Information for the consideration of the Board in its determination of the annual overdraft and accumulated overdraft as of September 30 of the current year
- A report as to the total production of water from the groundwater supplies of the District and its zones as of September 30 of the current year
- Information for the consideration of the Board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the District and its zones
- The amount of water the District is obligated to purchase during the ensuing water year
- A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the District and its zones during the ensuing water year
- A recommendation as to whether or not a groundwater charge should be levied in any zone(s) of the District in the ensuing water year and if so, a rate per acre-foot for all water other than agricultural water for such zone(s)
- Any other information the Board requires.
- The full text of Appendix 70, Section 70-7.6 through 7.8 is enclosed at the end of this appendix.
- Each water year a special topic is identified for further consideration. These topics have included water quality, salt loading, shallow wells, and others. Additional analyses and documentation provided in previous annual reports are summarized in **Table A-2.**

District management of water resources is focused on three Zones of Benefit, listed below.

Table A-1. District Zones of Benefit

Zone	Area	Provides
1	Entire County	Specific District administrative expenses
3	San Benito River Valley (Paicines to San Juan) and Tres Pinos River Valley (Paicines to San Benito River)	Operation of Hernandez and Paicines reservoirs and related groundwater recharge and management activities
6	San Juan, Hollister East, Hollister West, Pacheco, Bolsa SE, and Tres Pinos subbasins	Importation and distribution of CVP water and related groundwater management activities

Table A-2. Special Topics in Previous Annual Reports

Water Year	Additional Analyses and Reporting
2000	Methodology to calculate water supply benefits of Zone 3 and 6 operations
2001	Preliminary salt balance
2002	Investigation of individual salt loading sources
2003	Documentation of nitrate in supply wells, drains, monitor wells, San Juan Creek
2004	Documentation of depth to groundwater in shallow wells
2005	Tabulation of waste discharger permit conditions and recent water quality monitoring results
2006	Rate study
2007	Water quality update
2008	Water budget update
2009	Water demand and supply
2010	Water quality update
2011	Water budget update
2012	Land use update
2013	Water quality update
2014	Water balance update and Groundwater Sustainability
2015	Groundwater Sustainability – Basin Boundaries and GSAs
2016	Water quality update
2017	Water budget update
2018	GSP Update
2019	Water quality update

Water Code Appendix 70 Excerpts

Section 70-7.6. Groundwater; investigation and report: recommendations San Benito County

Sec. 7.6. the board by resolution require the district to annually prepare an investigation and report on groundwater conditions of the district and the zones thereof, for the period from October 1 of the preceding calendar year through September 30 of the current year and on activities of the district for protection and augmentation of the water supplies of the district and the zones thereof. The investigation and report shall include all of the following information:

(a) Information for the consideration of the board in its determination of the annual overdraft.

(b) Information for the consideration of the board in its determination of the accumulated overdraft as of September 30 of the current calendar year.

(c) A report as to the total production of water from the groundwater supplies of the district and the zones thereof as of September 30 of the current calendar year.

(d) An estimate of the annual overdraft for the current water year and for the ensuing water year.

(e) Information for the consideration of the board in its determination of the estimated amount of agricultural water and the estimated amount of water other than agricultural water to be withdrawn from the groundwater supplies of the district and the zones thereof for the ensuing water year.

(f) The amount of water the district is obligated to purchase during the ensuing water year.

(g) A recommendation as to the quantity of water needed for surface delivery and for replenishment of the groundwater supplies of the district and the zones thereof the ensuing water year.

(h) A recommendation as to whether or not a groundwater charge should be levied in any zone or zones of the district during the ensuing year.

(i) If any groundwater charge is recommended, a proposal of a rate per acre-foot for agricultural water and a rate per acre-foot for all water other than agricultural water for such zone or zones.

(j) Any other information the board requires.

(Added by Stats. 1965, c. 1798, p.4167, 7. Amended by Stats.1967,c.934, 5, eff. July27,1967; Stats. 1983, c. 402, 1; Stats. 1998, c. 219 (A.B.2135), 1.)

Section 70-7.7. Receipt of report; notice of hearing; contents; hearing

Sec. 7.7. (a) On the third Monday in December of each year, the groundwater report shall be delivered to the clerk of the board in writing. The clerk shall publish, pursuant to Section 6061 of the Government Code, a notice of the receipt of the report and of a public hearing to be held on the second Monday of January of the following year in a newspaper of general circulation printed and published within the district, at least 10 days prior to the date at which the public hearing regarding the groundwater report shall be held. The notice shall include, but is not limited to, an invitation to all operators of water producing facilities within the district to call at the offices of the district to examine the groundwater report.

(b) The board shall hold, on the second Monday of January of each year, a public hearing, at which time any operator of a water-producing facility within the district, or any person interested in the condition of the groundwater supplies or the surface water supplies of the district, may in person, or by representative, appear and submit evidence concerning the groundwater conditions and the surface water supplies of the district. Appearances also may be made supporting or protesting the written groundwater report, including, but not limited to, the engineer's recommended groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4167, 8. Amended by Stats. 1983, c. 02,2; Stats. 1998, c. 219 (A.B.2135,2.)

Section 70-7.8. Determination of groundwater charge; establishment of rates; zones; maximum charge; clerical errors

Sec. 7.8. (a) Prior to the end of the water year in which a hearing is held pursuant to subdivision (b) of Section 7.7, the board shall hold a public hearing, noticed pursuant to Section 6061 of the government Code, to determine if a groundwater charge should be levied, it shall levy, assess, and affix such a charge or charges against all persons operating groundwater- producing facilities within the zone or zones during the ensuing water year. The charge shall be computed at fixed and uniform rate per acre-foot for agricultural water, and at a fixed and uniform rate per acre-foot for all water other than agricultural water. Different rates may be established in different zones. However, in each zone, the rate for agricultural water shall be fixed and uniform and the rate for water other than agricultural water shall be fixed and uniform. The rate for agricultural water shall not exceed one-third of the rate for all water other than agricultural water.

(b) The groundwater charge in any year shall not exceed the costs reasonably borne by the district in the period of the charge in providing the water supply service authorized by this act in the district or a zone or zones thereof.

(c) Any groundwater charge levied pursuant to this section shall be in addition to any general tax or assessment levied within the district or any zone or zones thereof.

(d) Clerical errors occurring or appearing in the name of any person or in the description of the water-producing facility where the production of water there from is otherwise properly charged, or in the making or extension of any charge upon the records which do not affect the substantial rights of the assesse or assesses, shall not invalidate the groundwater charge.

(Added by Stats. 1965, c. 1798, p. 4168, 9. Amended by Stats. 1983, c. 402, 3; Stats.1983, c. 402, 3; Stats. 1998, c. 219 (A.B.2135), 3.)

APPENDIX B CLIMATE DATA

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Table B-2. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Table B-1. Monthly Precipitation at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	0.12	0.01	2.21	4.38	4.52	1.56	1.33	1.32	0.00	0.01	0.00	0.00	15.46	117%
1997	0.96	3.16	4.26	6.84	0.21	0.09	0.19	0.02	0.10	0.00	0.00	0.03	15.86	120%
1998	0.16	3.78	2.59	4.94	9.06	2.70	2.31	2.40	0.09	0.02	0.00	0.08	28.13	213%
1999	0.54	1.93	0.79	2.54	2.49	1.52	0.67	0.06	0.07	0.00	0.00	0.00	10.61	80%
2000	0.14	0.98	0.11	4.05	4.53	0.68	0.40	0.45	0.10	0.00	0.00	0.02	11.46	87%
2001	3.54	0.80	0.23	2.86	2.77	0.62	2.20	0.01	0.01	0.03	0.02	0.00	13.09	99%
2002	0.70	11.48	11.93	0.66	1.15	1.57	0.37	0.28	0.00	0.00	0.00	0.00	28.14	213%
2003	0.00	1.67	5.04	0.77	1.41	1.06	3.05	0.06	0.00	0.00	0.06	0.00	13.12	99%
2004	0.20	0.60	5.25	1.31	4.21	0.59	0.27	0.08	0.01	0.00	0.00	0.01	12.53	95%
2005	1.95	0.54	3.46	2.49	2.89	3.42	0.83	0.64	0.43	0.00	0.00	0.04	16.69	126%
2006	0.07	0.27	3.08	1.49	1.01	4.96	1.73	0.39	0.01	0.00	0.02	0.01	13.04	99%
2007	0.20	0.73	1.69	0.57	2.22	0.29	0.55	0.02	0.00	0.02	0.00	0.43	6.72	51%
2008	0.71	0.67	0.92	4.56	2.06	0.09	0.06	0.00	0.00	0.00	0.00	0.00	9.07	69%
2009	0.28	1.05	1.89	0.35	3.73	1.83	0.20	0.47	0.00	0.00	0.00	0.15	9.95	75%
2010	0.50	0.02	1.31	2.29	2.19	1.74	3.44	0.61	0.00	0.01	0.00	0.00	12.11	92%
2011	0.72	1.85	2.59	1.57	2.63	2.33	0.19	0.78	0.30	0.00	0.00	0.00	12.96	98%
2012	0.69	0.96	0.07	0.81	0.46	2.34	1.39	0.26	0.09	0.00	0.00	0.00	7.07	54%
2013	0.01	2.23	1.15	1.35	0.64	0.46	0.30	0.02	0.01	0.00	0.03	0.10	6.30	48%
2014	0.07	0.37	0.17	0.22	1.91	1.59	0.86	0.02	0.00	0.00	0.00	0.14	5.35	41%
2015	1.57	0.48	5.78	0.02	1.20	0.22	0.24	0.87	0.00	0.01	0.09	0.08	10.56	80%
2016	0.22	3.65	1.58	3.98	0.57	3.72	0.79	0.05	0.08	0.08	0.06	0.10	14.88	113%
2017	1.77	2.48	3.33	4.66	6.05	1.70	1.09	0.50	0.32	0.00	0.02	0.00	21.92	166%
2018	0.20	1.12	0.19	2.39	0.29	2.74	1.33	0.00	0.00	0.00	0.00	0.00	8.26	63%
2019	0.17	2.52	1.48	2.24	4.02	2.55	0.25	1.95	0.20	0.00	0.00	0.00	15.38	117%
2020	0.00	1.40	3.69	1.39	0.00	2.78	1.18	0.42	0.24	0.13	0.02	0.00	11.25	85%
AVG	0.62	1.79	2.59	2.35	2.49	1.73	1.01	0.47	0.08	0.01	0.01	0.05	13.20	100%

Note: The average precipitation is based on the period of record (1875-2018).

-The CIMIS value for September 2017 (2.4") includes measurement error due to irrigation overspray. The corrected District value is 0".

-The CIMIS value for February, May, June, and August 2018 (0.8", 2.6", 0.1", 0.03") includes measurement error due to irrigation overspray. The corrected District value is 0.3" for February and 0" for all other months.

-The CIMIS value for October and November 2018 included measurement error due to irrigation overspray. The corrected District value is 0.17" for October and 2.52" for

Table B-2. Reference Evapotranspiration at the SBCWD CIMIS Station (inches)

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	% Normal
1996	3.88	2.24	1.22	1.48	1.88	3.67	5.10	6.06	6.73	7.39	6.68	4.71	51.04	104%
1997	3.84	1.84	1.37	1.38	2.48	4.27	5.84	7.51	7.13	7.18	6.71	5.67	55.22	112%
1998	3.85	1.84	1.52	1.29	1.38	2.82	4.26	4.53	5.27	6.91	6.83	4.72	45.22	92%
1999	3.51	1.73	1.52	1.54	1.84	3.01	4.72	5.80	6.66	6.92	5.91	4.67	47.83	97%
2000	4.00	1.98	1.89	1.22	1.62	3.69	5.14	6.04	6.73	6.74	6.19	4.74	49.98	101%
2001	2.91	1.71	1.47	1.47	1.81	3.07	3.90	6.15	6.54	6.02	6.23	4.75	46.03	93%
2002	3.51	1.91	1.24	1.53	2.26	3.66	4.21	6.37	7.05	7.24	6.14	5.39	50.51	102%
2003	3.57	1.94	1.25	1.56	1.80	3.87	3.79	6.00	6.47	7.29	6.15	5.07	48.76	99%
2004	4.11	1.73	1.24	1.32	1.72	3.98	5.19	6.38	6.71	6.63	5.98	5.32	50.31	102%
2005	3.08	1.69	1.44	1.30	1.69	2.95	4.38	5.74	6.36	6.86	6.13	4.55	46.17	94%
2006	3.59	2.00	1.19	1.43	2.18	2.43	3.00	5.49	6.41	7.02	5.60	4.38	44.72	91%
2007	3.28	1.69	1.37	1.77	1.77	4.11	4.76	6.29	6.89	6.79	6.46	4.65	49.83	101%
2008	3.48	2.21	1.44	1.25	2.03	3.76	5.17	5.97	6.88	6.74	6.31	5.00	50.24	102%
2009	3.82	1.87	1.36	1.70	1.72	3.51	4.83	5.53	6.31	7.08	6.31	5.30	49.34	100%
2010	3.45	2.21	1.71	1.26	1.80	3.49	3.87	5.37	6.71	6.29	5.88	4.98	47.02	95%
2011	3.02	1.86	1.05	1.59	2.05	2.71	4.43	5.34	5.99	6.56	5.74	4.64	44.98	91%
2012	3.27	1.89	1.83	1.84	2.46	3.34	4.39	6.39	6.81	6.63	6.00	4.60	49.45	100%
2013	3.25	1.82	1.16	1.50	2.10	3.71	5.39	6.26	6.36	6.46	5.98	4.83	48.82	99%
2014	3.51	2.02	1.80	2.08	1.85	3.58	4.89	6.83	6.61	6.43	6.02	4.74	50.36	102%
2015	3.90	1.86	1.45	1.80	2.16	4.13	5.12	5.01	6.41	6.52	6.49	5.34	50.19	102%
2016	4.11	2.05	1.39	1.32	2.72	3.40	4.65	5.71	7.54	7.22	5.74	5.15	51.00	103%
2017	3.40	2.11	1.47	1.55	1.76	3.73	4.45	6.29	6.82	7.62	6.03	5.16	50.39	102%
2018	4.15	1.93	1.98	1.57	2.66	3.25	4.81	5.83	7.29	7.65	6.60	5.15	52.87	107%
2019	3.85	2.20	1.54	1.58	1.91	3.42	4.81	5.17	6.68	7.15	6.54	5.36	50.21	102%
2020	4.24	2.31	1.37	1.60	2.78	3.15	4.54	6.53	7.17	6.96	6.23	4.78	51.66	105%
AVG	3.62	1.95	1.45	1.52	2.02	3.47	4.63	5.94	6.66	6.89	6.20	4.95	49.29	100%

Note: The averages are for the available period of record, 1995 for reference evapotranspiration.

APPENDIX C GROUNDWATER DATA

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Figure C-2. Depth to Water October 2020

Figure C-3. Groundwater Elevations October 2019

Table C-1. Groundwater Elevations October 2019 through October 2020

Well Number	Well Depth (feet)	Depth to Top of Screens (feet)	Subbasin	Groundwater Elevations (feet MSL)				
				Oct-19	Jan-20	Apr-20	Jul-20	Oct-20
Southern Management Area								
14-6-14Q	UNK	UNK	Paicines	634.5	638.0	636.2	627.8	635.4
14-6-35B	UNK	UNK	Paicines	655.0	655.7	658.6	654.8	654.8
14-6-26K1	UNK	UNK	Paicines	642.6	644.2	645.9	643.4	644.3
14-6-26F	UNK	UNK	Paicines	644.8	644.3	644.7	644.5	644.0
14-6-36D	UNK	UNK	Paicines	NM	NM	649.5	642.5	640.5
14-6-26H1	UNK	UNK	Paicines	640.1	650.3	642.4	638.5	633.5
1536	UNK	UNK	TPCV	298.0	303.0	304.0	299.0	294.0
14-6-13B	UNK	UNK	TPCV	648.2	649.7	649.0	643.8	639.4
GRANITE ROCK WELL 1	UNK	UNK	TPCV	312.4	314.2	312.4	309.9	307.5
GRANITE ROCK WELL 2	UNK	UNK	TPCV	337.0	337.1	332.2	326.1	321.1
San Justo 5	UNK	UNK	TPCV	275.5	275.1	275.0	275.0	274.8
14-7-19G	UNK	UNK	TPCV	711.3	714.5	715.2	710.0	705.8
14-7-20K	UNK	UNK	TPCV	719.3	721.1	726.6	718.9	715.5
San Juan Management Area								
12-4-17L20	UNK	UNK	SJ	120.5	124.1	NM	121.3	120.2
12-4-18J1	UNK	UNK	SJ	123.0	124.6	125.2	122.1	120.6
12-4-20C3	UNK	UNK	SJ	111.8	113.1	NM	NM	NM
12-4-21M1	250	UNK	SJ	142.4	143.9	147.7	142.8	141.6
12-4-26G1	876	240	SJ	148.3	156.1	154.8	150.7	155.5
12-4-34H1	387	120	SJ	151.7	168.4	173.7	142.6	146.0
12-4-35A1	325	110	SJ	172.6	191.1		164.0	167.7
12-5-30H1	240	UNK	SJ	206.2	206.6	208.1	208.6	207.0
12-5-30R1	199	87	SJ	366.5	NM	NM	NM	NM
12-5-31H1	UNK	UNK	SJ	199.5	211.7	212.0	200.5	195.4
13-4-03H1	312	168	SJ	149.8	169.1	171.7	145.9	138.5
13-4-4A3	UNK	UNK	SJ	191.2	194.0	194.2	190.3	165.0
RIDER BERRY	UNK	UNK	SJ	146.2	160.0	160.7	151.3	134.4
Bolsa Management Area								
11-4-25H1	UNK	UNK	B	75.3	118.4	122.0	46.5	63.5
11-4-26B1	UNK	UNK	B	127.4	137.0	137.7	124.3	123.1
11-4-34A1	100	UNK	B	132.8	135.0	134.8	128.1	130.5
11-5-20N1	300	UNK	B	68.8	111.4	117.1	57.6	55.6
11-5-21E2	220	100	B	155.0	155.0	155.0	155.0	155.0
11-5-27P2	331	67	B	170.4	174.2	174.2	169.2	168.7
11-5-28B1	198	125	B	168.0	168.0	168.0	168.0	168.0
11-5-28P4	140	80	B	165.0	165.0	165.0	165.0	165.0
11-5-31F1	515	312	B	57.2	93.7	96.2	47.1	51.5
11-5-33B1	125	UNK	B	169.0	169.0	169.0	169.0	169.0
12-5-05G1	500	150	B	107.1	107.7	107.0	105.2	104.8
12-5-05M1	UNK	UNK	B	58.3	81.8	85.0	40.6	49.6
12-5-06L1	UNK	UNK	B	147.0	150.6	148.0	149.0	146.4
12-5-07P1	750	360	B	68.0	69.0	70.0	64.0	65.8
12-5-17D1	950	314	B	75.0	77.0	74.0	70.0	71.5
Llagas - SCVWD								
11S04E02D008	UNK	UNK	SCVWD	146.3	165.1	NM	137.0	136.9
11S04E02N001	UNK	UNK	SCVWD	139.6	158.6	NM	119.4	128.2
11S04E03J002	UNK	UNK	SCVWD	144.9	165.1	NM	132.1	132.5
11S04E08K002	UNK	UNK	SCVWD	152.1	162.2	NM	151.3	144.0
11S04E10D004	UNK	UNK	SCVWD	148.0	159.9	155.5	139.0	137.9
11S04E15J002	UNK	UNK	SCVWD	136.4	144.0	140.8	123.8	125.3
11S04E17N004	UNK	UNK	SCVWD	151.6	162.3	NM	151.2	143.9
11S04E22N001	UNK	UNK	SCVWD	124.0	142.5	NM	121.9	122.7
11S04E32R002	UNK	UNK	SCVWD	120.9	133.8	126.6	117.4	117.0

Table C-1. Groundwater Elevations October 2019 through October 2020

Well Number	Well Depth (feet)	Depth to Top of Screens (feet)	Subbasin	Groundwater Elevations (feet MSL)				
				Oct-19	Jan-20	Apr-20	Jul-20	Oct-20
Hollister Management Area								
12-5-09M1	240	105	BSE	124.9	126.3	137.0	126.4	127.8
12-5-22N1	372	250	BSE	NM	87.1	92.9	89.4	90.3
2317	UNK	UNK	HE	224.5	225.1	225.6	225.4	225.2
12-5-22C1	237	102	HE	176.0	187.7	188.8	129.5	178.3
12-5-22J2	355	120	HE	192.5	195.0	196.0	194.7	194.2
12-5-23A20	862	178	HE	184.0	184.8	186.0	185.5	180.0
12-5-36B20	500	430	HE	199.2	200.0	196.7	196.8	194.8
12-6-07P1	147	UNK	HE	243.6	246.1	248.0	243.5	242.5
12-6-18G1	198	70	HE	265.3	270.0	275.0	267.5	265.0
12-6-30E1	UNK	UNK	HE	347.9	348.9	348.0	347.5	347.0
13-6-07D2	UNK	UNK	HE	338.3	338.5	338.9	337.9	337.3
ROSSI 1	UNK	UNK	HE	231.6	233.2	233.2	228.3	230.5
12-5-27E1	175	UNK	HW	201.7	233.6	209.2	205.6	204.6
12-5-28J1	220	UNK	HW	215.0	217.8	221.7	218.2	217.0
12-5-28N1	408	168	HW	222.7	223.3	230.6	NM	NM
12-5-33E2	121	81	HW	216.0	217.7	221.4	217.3	218.0
12-5-34P1	195	153	HW	220.0	223.5	227.0	225.0	222.5
13-5-03L1	126	UNK	HW	231.0	233.7	237.6	235.1	233.1
13-5-04B	UNK	UNK	HW	230.4	233.4	235.7	233.6	231.3
13-5-10B1	UNK	UNK	HW	220.5	224.3	214.5	213.0	216.5
13-5-10L1	252	52	HW	292.0	NM	NM	NM	NM
13-5-11E1	UNK	UNK	HW	281.7	290.2	288.4	287.5	284.5
San Justo 4	UNK	UNK	HW	272.1	271.9	270.4	271.8	271.0
San Justo 6	UNK	UNK	HW	236.2	233.5	235.5	236.0	234.3
11-5-26N2	232	95	P	171.0	174.6	174.6	170.0	169.3
11-5-26R3	225	65	P	189.0	185.3	185.8	180.6	178.6
11-5-35C1	180	UNK	P	157.5	180.5	180.7	170.4	174.6
11-5-35G1	230	UNK	P	182.2	184.8	185.2	182.6	182.9
11-5-35Q3	UNK	UNK	P	170.0	179.1	176.9	158.7	168.7
11-5-36C1	98	UNK	P	195.4	197.2	197.1	198.5	192.2
11-5-36M1	UNK	UNK	P	183.9	183.9	186.0	184.1	182.0
11-6-31M2	188	155	P	236.5	227.3	227.0	224.6	218.9
12-5-01G2	300	UNK	P	183.7	184.4	182.8	177.3	180.8
12-5-02H5	128	42	P	182.8	184.1	181.7	179.8	178.8
12-5-02L2	170	UNK	P	195.1	196.5	197.0	195.1	194.1
12-5-03B1	128	100	P	182.0	182.0	182.0	182.0	182.0
12-6-06K1	260	16	P	260.0	260.0	260.0	260.0	260.0
12-6-06L4	235	50	P	220.4	220.2	220.0	219.0	215.3
13-5-11Q1	178	61	TP	294.4	295.4	294.4	293.0	294.6
13-5-12D4	UNK	UNK	TP	229.0	251.0	250.0	249.0	244.0
13-5-12K1	UNK	UNK	TP	328.0	329.0	330.0	321.0	288.0
13-5-12N20	352	301	TP	319.6	320.3	320.7	319.0	317.4
13-5-13F1	134	30	TP	334.1	335.0	335.9	335.3	334.0
13-5-13H1	252	112	TP	344.9	346.1	346.1	344.0	342.7
13-5-13J2	180	UNK	TP	347.1	348.2	347.5	346.0	344.2
13-5-13Q1	185	44	TP	333.0	336.8	336.0	332.9	331.5
13-5-14C1	UNK	UNK	TP	293.0	294.1	294.0	291.8	289.3
13-6-19J1	340	128	TP	435.2	434.6	434.6	NM	NM
13-6-19K1	211	UNK	TP	360.8	361.2	359.9	399.7	394.6
13-6-20K1	UNK	UNK	TP	429.0	425.0	420.3	420.9	417.8
11-5-12E1	103	52	PC	NM	235.4	NM	NM	NM
11-5-13D1	125	UNK	PC	227.3	229.7	232.0	220.8	222.5
11-5-23R2	118	43	PC	206.7	NM	210.3	207.5	205.5
11-5-24C1	134	UNK	PC	213.0	NM	NM	NM	NM
11-5-24C2	165	70	PC	223.0	226.1	226.7	223.5	218.3
11-5-24L1	70	UNK	PC	207.6	212.0	212.6	207.6	202.5
11-5-25G1	225	UNK	PC	208.4	208.4	208.0	201.0	198.9

UNK - Unknown
NM - Not Monitored

Table C-2. Groundwater Change Attributes

Subbasin	Subbasin Area (Acres)	Average Storativity[1]
San Juan	11,708	0.05
Hollister West	6,050	0.05
Tres Pinos	4,725	0.05
Pacheco	6,743	0.03
Northern Hollister East	10,686	0.03
Southern Hollister East	5,175	0.03
Bolsa SE	2,691	0.08
Bolsa	20,003	0.01

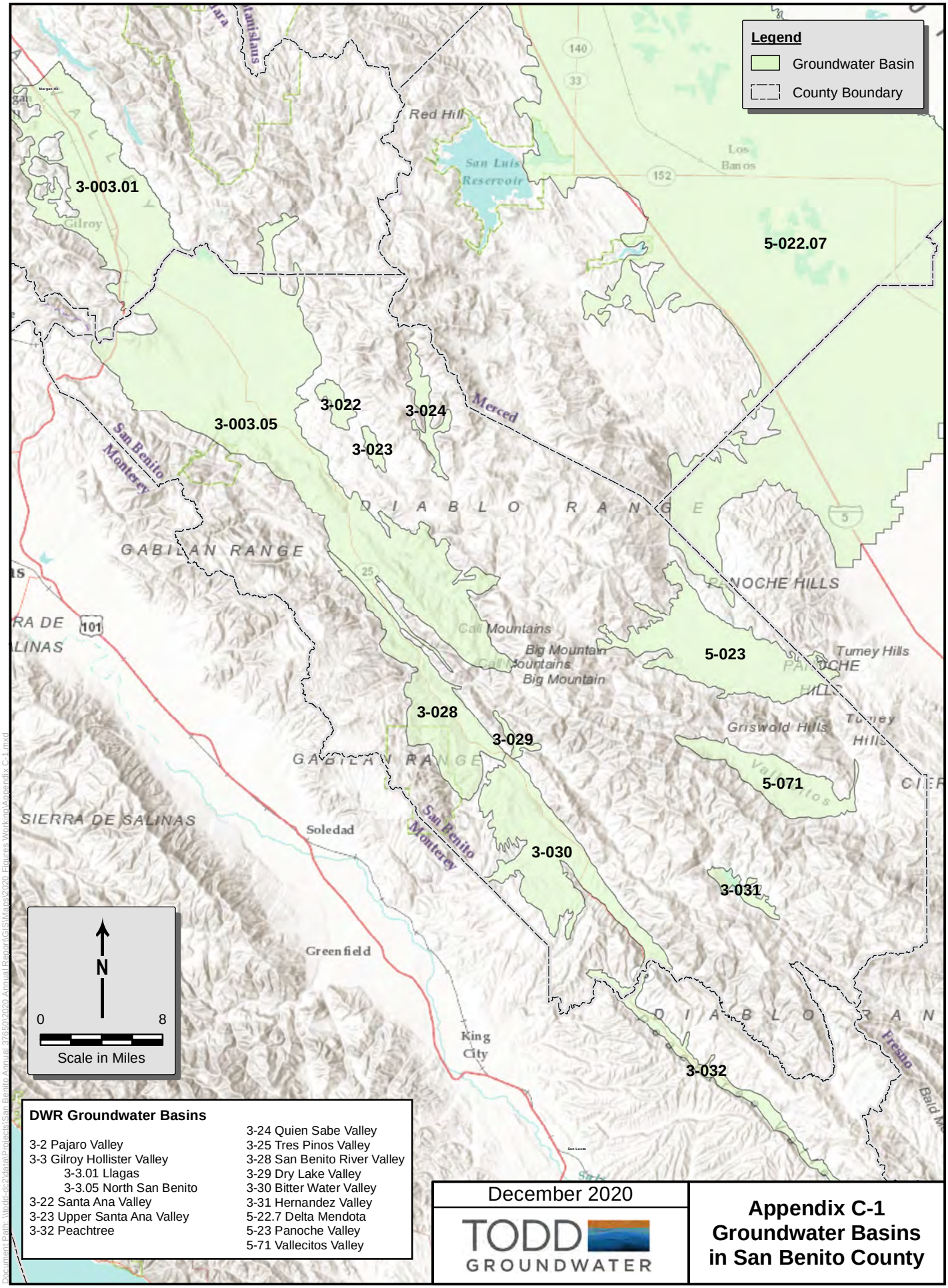
1. Storativity values from Yates/Zhang, 2001

Table C-3. Groundwater Change in Elevation 2006-2020 (feet)

	Average Change in Groundwater Elevation														
Subbasin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
San Juan	0.9	(4.5)	0.3	(0.7)	(1.4)	(0.9)	0.0	(10.7)	(7.9)	(9.4)	(3.6)	14.6	3.5	(1.7)	(5.8)
Hollister West	3.1	(1.7)	3.3	(1.4)	(1.6)	(0.7)	2.1	(5.7)	(17.4)	(3.6)	0.9	6.9	9.5	6.5	2.3
Tres Pinos	2.5	(2.3)	0.7	8.1	(10.5)	1.0	2.5	(2.5)	(6.7)	(6.7)	(6.0)	4.4	0.9	15.0	(7.6)
Pacheco	1.9	(4.4)	(1.4)	8.1	(6.6)	1.9	(4.4)	(3.0)	(7.4)	1.9	3.0	8.6	(2.4)	1.8	(3.2)
Northern Hollister East	3.6	(6.5)	(4.2)	10.1	(8.7)	2.7	(2.4)	1.6	(9.1)	0.8	(1.5)	5.8	2.6	0.6	(1.6)
Southern Hollister East	3.3	(1.5)	5.5	9.4	4.9	(1.9)	(2.2)	(1.1)	(6.9)	1.6	8.1	0.5	7.2	2.4	(1.2)
Bolsa SE	1.5	(6.8)	11.5	(24.8)	25.3	(11.6)	0.2	(4.3)	(10.7)	(3.3)	(9.9)	8.2	7.2	3.2	0.2
Bolsa	6.8	(3.3)	9.0	(16.9)	23.2	(11.2)	10.7	(3.4)	(25.6)	4.6	(2.9)	10.6	(2.6)	(0.6)	(3.29)

Table C-4. Groundwater Change in Storage 2006-2020 (acre-feet)

	Average Change in Groundwater Storage (AF)														
Subbasin	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
San Juan	510	(2,626)	168	(437)	(811)	(523)	0	(6,239)	(4,653)	(5,530)	(2,086)	8,531	2,077	(1,016.0)	(3,383.3)
Hollister West	947	(510)	1,001	(431)	(477)	(198)	640	(1,730)	(5,267)	(1,090)	282	2,084	2,878	1,962.0	684.0
Tres Pinos	584	(553)	169	1,913	(2,485)	228	601	(586)	(1,574)	(1,579)	(1,427)	1,034	216	3,552.0	(1,802.8)
Pacheco	391	(892)	(275)	1,639	(1,335)	389	(882)	(597)	(1,490)	388	604	1,736	(488)	362.0	(654.1)
Northern Hollister East	1,167	(2,087)	(1,350)	3,253	(2,798)	870	(757)	528	(2,918)	242	(474)	1,867	818	203.0	(515.7)
Southern Hollister East	506	(227)	846	1,457	766	(301)	(339)	(177)	(1,067)	250	1,263	72	1,123	365.0	(185.0)
Bolsa SE	333	(1,458)	2,478	(5,338)	5,443	(2,508)	53	(918)	(2,300)	(719)	(2,139)	1,767	1,543	695.0	37.0
Bolsa	1,358	(659)	1,794	(3,372)	4,631	(2,239)	2,144	(674)	(5,112)	915	(578)	2,125	(514)	(112.0)	(658.1)



DWR Groundwater Basins

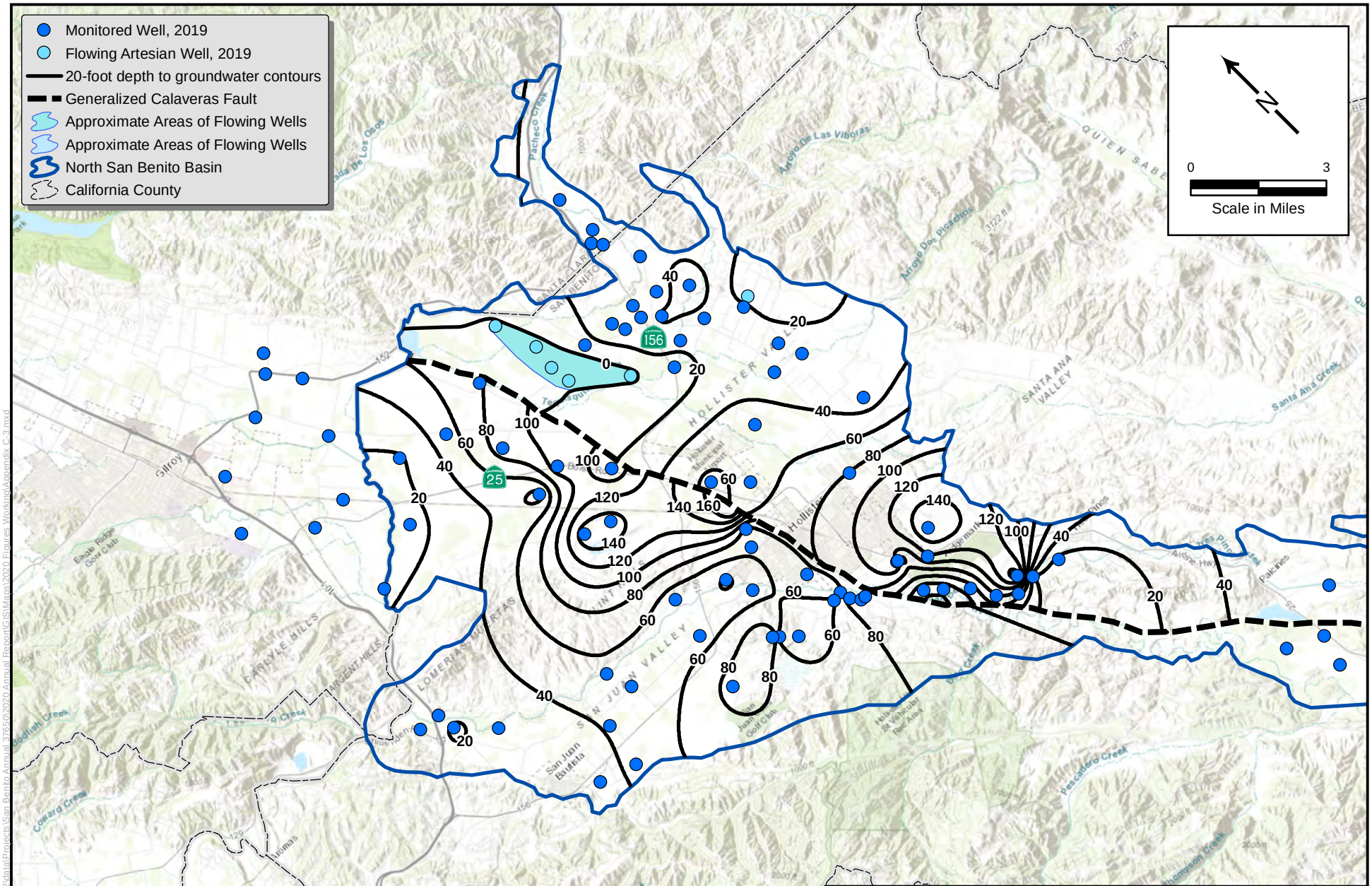
3-2 Pajaro Valley
3-3 Gilroy Hollister Valley
3-3.01 Llagas
3-3.05 North San Benito
3-22 Santa Ana Valley
3-23 Upper Santa Ana Valley
3-32 Peachtree
3-24 Quien Sabe Valley
3-25 Tres Pinos Valley
3-28 San Benito River Valley
3-29 Dry Lake Valley
3-30 Bitter Water Valley
3-31 Hernandez Valley
5-22.7 Delta Mendota
5-23 Panoche Valley
5-71 Vallecitos Valley

December 2020

TODD GROUNDWATER

Appendix C-1
Groundwater Basins in San Benito County

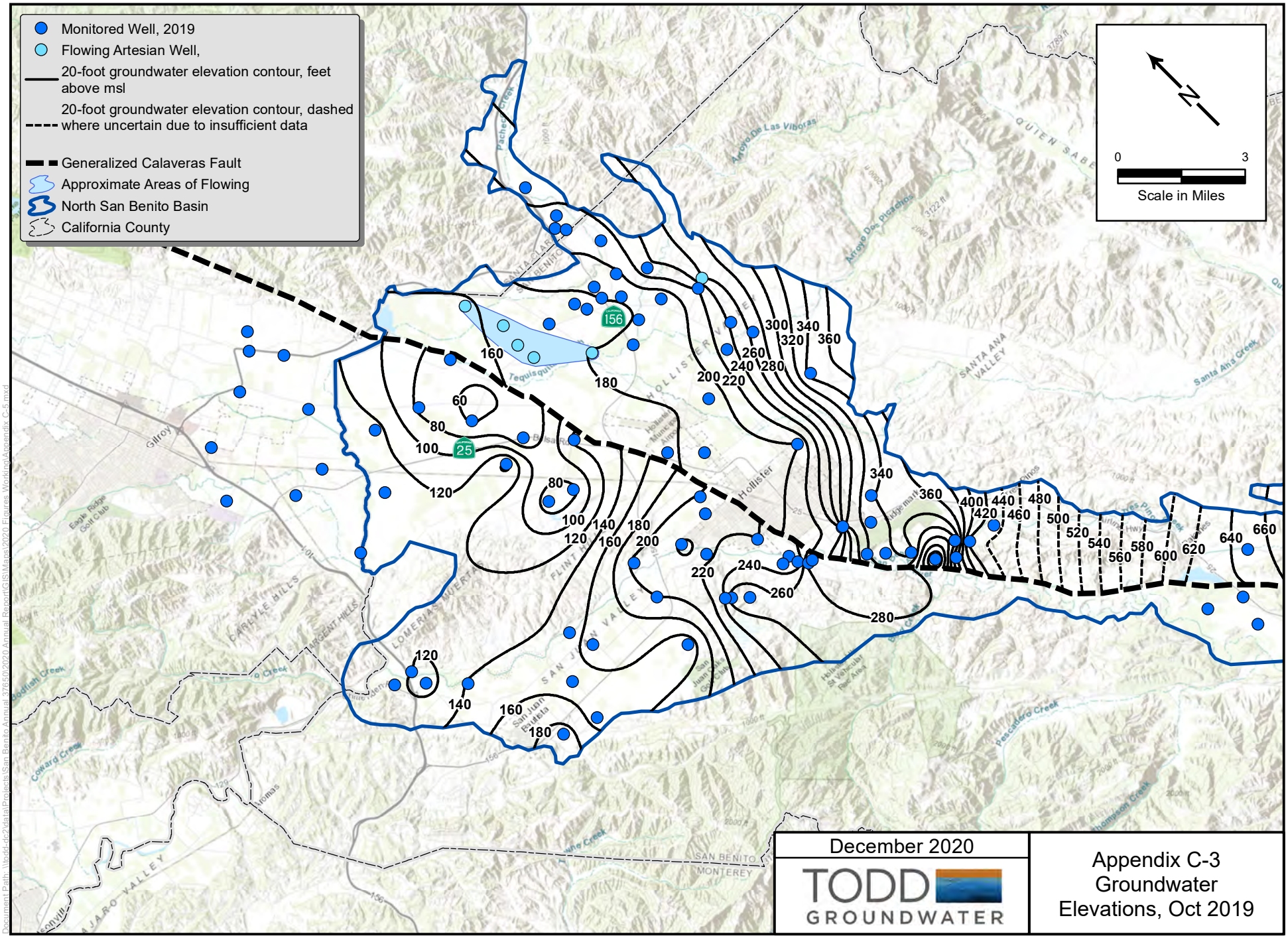
Document Path: \\todd-dc2\data\Projects\San Benito Annual 3765\2020 Annual Report\GIS\Maps\2020 Figures\Working\Appendix C-1.mxd



December 2020

TODD GROUNDWATER

Appendix C-2
Depth to Water
October 2020



December 2020

TODD GROUNDWATER

Appendix C-3
Groundwater
Elevations, Oct 2019

APPENDIX D PERCOLATION DATA

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Table D-3. Historical Percolation of CVP Water (AFY)

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Table D-5. Historical Percolation of Municipal Wastewater (AFY)

Figure D-1. Reservoir Releases for Percolation

Table D-1. Reservoir Water Budgets for Water Year 2020 (acre-feet)

	Hernandez	Paicines	San Justo	
Observed Storage				
Starting Storage (Oct 2019)	2,100	300	4,861	
Ending Storage (Sept 2020)	506	300	6,143	
Inflows				
Rainfall	128	60	199	
San Benito River	8,390	1,248	n.a.	
Hernandez-Paicines transfer	n.a.	535	n.a.	
San Felipe Project*	n.a.	n.a.	21,357	*
Total Inflows	**8,518**	**1,842**	**21,556**	
Outflows				
Hernandez spills	0	n.a.	n.a.	
Hernandez-Paicines transfer	535	n.a.	n.a.	
Tres Pinos Creek percolation releases	n.a.	2,037	n.a.	
San Benito River percolation releases	9,473	0	n.a.	
CVP Deliveries*	n.a.	n.a.	20,287	*
Evaporation and seepage (less interceptor wells)	476	310	1,152	
Total Outflows	**10,484**	**2,347**	**21,439**	
Change in Storage				
Observed storage change (Ending - Starting)	**-1,594**	**0**	**1,282**	
Calculated net storage change (Inflow - Outflows)	**-1,966**	**-505**	**116**	
Unaccounted for Water (Observed - Calculated)**	**372**	**505**	**1,166**	

Reservoir Information			
Reservoir capacity	17,200	2,870	11,000
Maximum storage	12,572	2,580	10,308
Minimum storage	558	250	4,573

* Reflects imported water for beneficial use, not all stored in reservoir

** Negative value is water shortage, positive value is water surplus

Table D-2. Historical Reservoir Releases (AFY)

WY	Hernandez	Paicines	TOTAL
1996	13,535	6,139	19,674
1997	3,573	2,269	5,842
1998	26,302	450	26,752
1999	12,084	1,293	13,377
2000	13,246	2,326	15,572
2001	12,919	3,583	16,502
2002	9,698	310	10,008
2003	5,434	0	5,434
2004	3,336	0	3,336
2005	19,914	677	20,591
2006	14,112	196	14,308
2007	12,022	1,254	13,276
2008	7,646	495	8,141
2009	4,883	0	4,883
2010	8,484	4,147	12,631
2011	9,757	2,397	12,154
2012	6,341	1,321	7,662
2013	3,963	677	4,640
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	23,191	2,407	25,597
2018	6,054	384	6,438
2019	15,924	2,045	17,969
2020	9,473	2,037	11,510
AVG	**9,676**	**1,376**	**11,052**

Table D-3. Historical Percolation of CVP Water (AFY)

		Arroyo de las Viboras			Arroyo Dos Picachos			Santa Ana Creek					San Benito River		
Water Year[1]	Pacheco Creek	Road	Creek 1 (Frog Ponds)	Creek 2	Fallon Road	Jarvis Lane	Creek	John Smith Road	Maranatha Road	Airline Highway	Ridgemark	Tres Pinos Creek (and Pond)	Union Road Pond	Hollister Ponds	Total
1994	232	136	515	0	0	550	209	0	0	0	0	85	158	0	1,885
1995	444	238	770	2	0	654	622	73	0	0	0	809	2,734	0	6,345
1996	0	494	989	832	67	235	708	531	197	134	25	21	6,097	0	10,330
1997	0	447	601	1,981	77	0	200	17	353	286	29	1,477	5,619	0	11,087
1998	0	132	109	403	0	0	0	65	0	158	74	518	1,084	0	2,543
1999	0	0	0	0	0	0	4	256	48	141	10	452	413	0	1,322
2000	1	0	0	6	0	0	3	236	21	240	12	285	938	0	1,740
2001	0	0	0	0	0	0	0	161	17	186	1	703	1,041	0	2,110
2002	0	0	0	2	0	0	1	78	2	143	0	426	470	0	1,122
2003	0	0	0	0	0	0	5	119	9	172	0	163	605	0	1,074
2004	0	0	0	0	0	0	52	83	0	0	0	1	882	0	1,018
2005	0	0	0	0	0	0	0	0	0	0	0	0	527	0	527
2006	0	0	0	0	0	0	7	156	0	0	0	1	451	0	614
2007	0	0	0	0	0	0	0	0	0	0	0	88	216	0	304
2008	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	340	0	0	0	0	0	0	0	0	0	2,209	0	2,549
2018	0	0	199	0	0	0	0	0	0	0	0	867	1,899	0	2,965
2019	0	0	335	0	0	0	0	0	0	0	0	1,775	2,932	0	5,043
2020	0	0	134	0	0	0	0	0	0	0	0	780	1,499	747	3,161

1. 2017-2020 percolation occurred only to recharge basins adjacent to the listed streams.

Table D-4. Percolation of Municipal Wastewater during Water Year 2020

	Pond Area[1] (acres)	Effluent Discharge (acre-feet)	Evaporation[2] (acre-feet)	Percolation (acre-feet)
Hollister - domestic	93	2,658	266	2,392
Hollister - industrial	39	0	0	0
Ridgemark Estates I & II	7	176	21	155
Tres Pinos	2	11	5	6
Total	141	2,846	292	2,553

Notes:

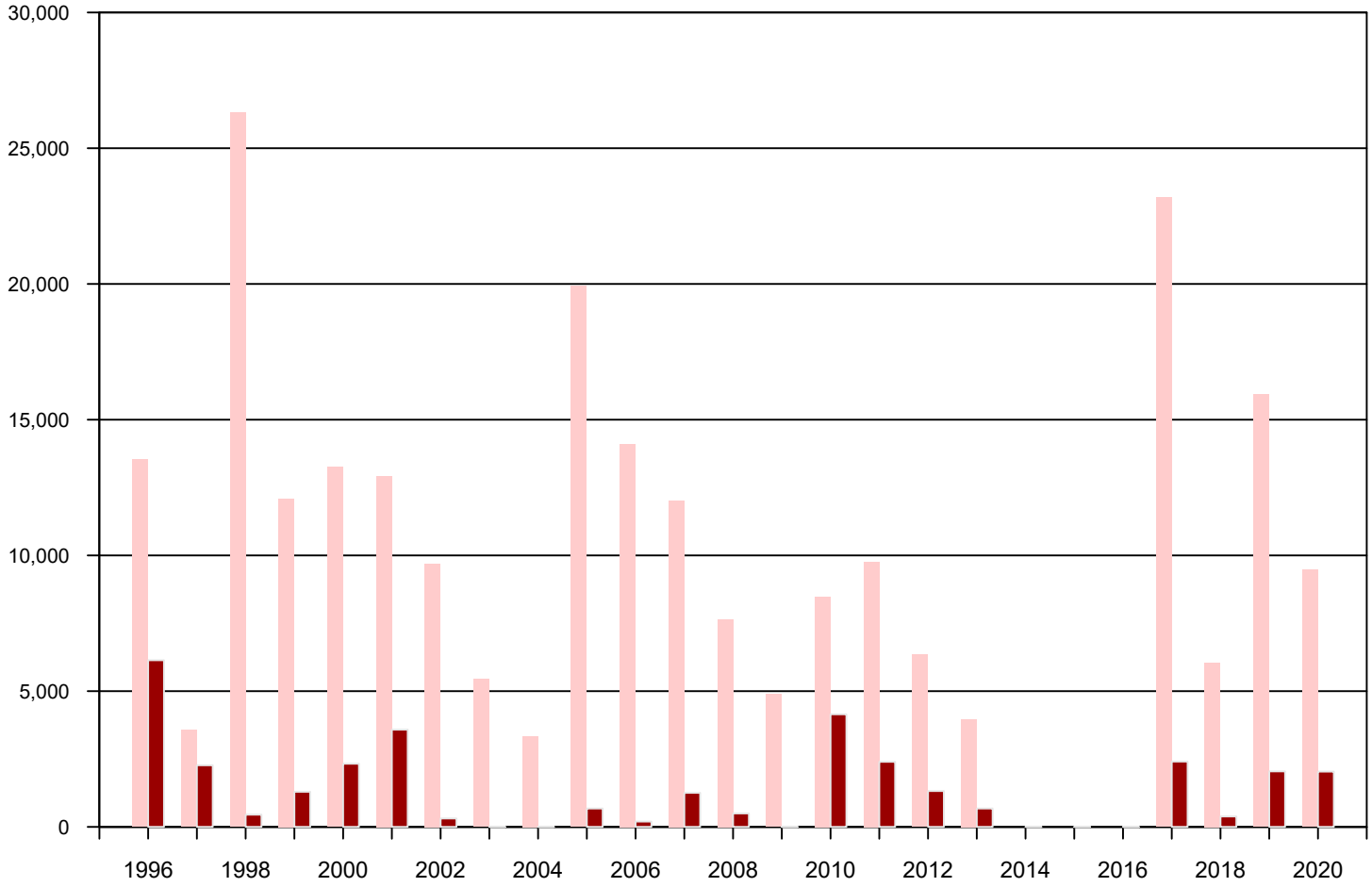
1. Hollister pond areas are from Dickson and Kenneth D. Schmidt and Associates (1999) and include treatment ponds in addition to percolation ponds at the domestic wastewater treatment plant. Assumes 80% of total pond area in use at any time (Rose, pers. comm.). These areas should be updated as operations change.

2. Average evaporation less precip = 43 inches (56 in/yr evaporation (DWR Bulletin 73-79) less 13 in/yr precip (CIMIS) The IWTP evaporation was adjusted to account only for when the ponds are in use.
The San Juan Bautista plant is not included because the unnamed tributary of San Juan Creek that receives its effluent usually gains flow along the affected reach and is on the southwest side of the San Andreas Fault. These conditions prevent the effluent from recharging the basin.

Table D-5. Historical Percolation of Municipal Wastewater (AFY)

	Hollister Reclamation Plant - Domestic	Hollister - industrial wastewater and stormwater	Ridgemark Estates I & II	Tres Pinos	TOTAL
1994	1,775	665	155	5	2,600
1995	1,935	610	180	10	2,735
1996	2,020	689	207	14	2,930
1997	1,965	909	201	17	3,092
1998	2,490	518	231	17	3,256
1999	1,693	1,476	156	12	3,337
2000	2,110	1,136	293	24	3,563
2001	1,742	1,078	303	24	3,147
2002	1,884	1,545	283	24	3,736
2003	2,009	1,432	279	24	3,744
2004	1,787	1,536	268	21	3,612
2005	1,891	1,323	227	26	3,468
2006	1,797	1,211	216	33	3,257
2007	1,740	1,228	139	19	3,126
2008	1,580	1,257	139	19	2,996
2009	1,976	428	172	19	2,594
2010	1,922	37	172	19	2,150
2011	1,807	466	183	19	2,476
2012	1,740	605	177	19	2,541
2013*	889	332	188	21	1,430
2014	1,552	86	179	21	1,838
2015	1,816	344	161	21	2,342
2016	1,923	305	154	21	2,402
2017	1,945	57	154	20	2,177
2018	1,365	57	150	15	1,587
2019	1,822	0	149	16	1,986
2020	2,392	0	155	6	2,553

*Potential missing data



Hernandez

Paicines

December 2020

TODD GROUNDWATER

Appendix D-1
Reservoir Releases for Percolation

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Figure E-2. Water Use in Zone 6 by Source

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Figure E-4. Annual Total of CVP and Groundwater by Use

Figure E-5. Portion of Total Supply from Groundwater Use

Table E-1. Recent CVP Allocation and Use

Water Year	Municipal and Industrial (M&I) CVP				Agricultural CVP			
	Percent of Contract Allocation[1]	Percent of Historic Average[2]	Contract Amount Used (AF)	Contract Amount Used (%)	Percent of Contract Allocation[3]	Percent of Contract and M&I Adjustment[2]	Contract Amount Used (AF)[4]	Contract Amount Used (%)
	(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)		(USBR Water Year Mar-Feb)		(Hydrologic Water Year Oct-Sep)	
2006	100%		3,152	38%	100%		19,840	56%
2007	100%		4,969	60%	40%		18,865	53%
2008	37%	75%	2,232	27%	40%	45%	10,514	30%
2009	29%	60%	1,978	24%	10%	11%	6,439	18%
2010	37%	75%	2,197	27%	45%	50%	10,061	28%
2011	100%		2,433	29%	80%		16,234	46%
2012	51%	75%	2,683	33%	40%	40%	17,267	49%
2013	47%	70%	2,652	32%	20%	22%	12,914	36%
2014	34%	50%	1,599	29%	0%	0%	7,545	21%
2015	25%		1,810	22%	0%		3,697	10%
2016	55%		1,914	23%	5%		4,434	12%
2017	100%		2,909	35%	100%		15,837	45%
2018	75%		5,679	69%	50%		17,418	49%
2019	100%		4,457	54%	75%		16,774	47%
2020	70%		4,953	60%	20%		15,327	43%
Average (11-20)	**66%**				**39%**			

Notes: 1 Total contract (100% allocation) M&I 8,250 AFY
2 Shortage Policy Adjustments
3 Total contract (100% allocation) Ag 35,550 AFY
4 Includes water percolated

Table E-2. Historical Water Use by Subbasin and Water Source (AFY)

Subbasin [1]	Pacheco		Bolsa Southeast			San Juan		Hollister West			Hollister East[2]			Tres Pinos		Total Zone 6		
Source	GW	CVP	GW	CVP	RW	GW	CVP	GW	CVP	RW	GW	CVP	RW	GW	CVP	GW	CVP	RW
1993	2,251	3,210	3,474	533		9,278	4,300	7,213	90		3,744	7,275		5,658	224	31,618	15,633	0
1994	3,748	3,394	3,467	602		10,859	3,836	7,327	87		5,475	6,808		5,294	263	36,169	14,990	0
1995	2,756	3,474	2,855	720		9,328	4,554	7,092	460		3,428	6,647		4,475	275	29,935	16,130	0
1996	2,533	3,500	2,682	782		8,726	5,187	5,717	679		3,396	8,267		3,695	408	26,748	18,823	0
1997	2,209	4,205	2,755	997		9,587	6,191	7,602	907		3,534	8,284		4,620	466	30,307	21,048	0
1998	2,035	2,165	1,561	361		6,963	4,099	4,991	591		4,037	5,291		3,751	289	23,338	12,796	0
1999	2,553	3,219	2,453	433		9,312	5,990	7,013	726		3,701	7,279		4,199	391	29,231	18,038	0
2000	2,270	3,256	2,418	355		8,681	6,372	7,590	869		3,108	7,279		4,006	542	28,073	18,673	0
2001	1,848	3,443	2,126	411		7,977	7,232	7,377	685		2,213	7,010		3,599	621	25,140	19,402	0
2002	2,322	3,840	2,193	497		7,571	7,242	6,577	706		2,588	7,390		3,994	737	25,244	20,411	0
2003	2,425	3,277	2,175	493		7,434	7,127	6,222	720		1,897	9,329		2,805	788	22,958	21,734	0
2004	2,461	3,607	2,405	740		8,121	7,357	4,971	614		2,321	10,726		3,204	966	23,484	24,010	0
2005	1,320	3,106	1,849	514		6,608	6,245	5,084	680		2,586	9,198		2,378	642	19,825	20,384	0
2006	1,208	3,495	1,864	661		6,741	7,200	4,633	579		2,555	10,253		2,537	803	19,538	22,992	0
2007	1,034	3,832	2,005	572		7,658	6,160	5,118	553		3,867	10,194		2,908	804	22,590	22,115	0
2008	1,900	1,568	2,014	333		7,796	3,160	4,375	399		3,962	6,792		2,743	493	22,789	12,745	0
2009	3,370	1,257	2,082	179		11,956	1,605	4,186	19		4,733	4,697		2,871	447	29,199	8,204	0
2010	2,553	1,771	1,897	207		9,561	3,452	4,081	10	151	4,460	6,056		1,686	488	24,238	11,984	151
2011	1,992	2,420	2,781	229		4,987	5,623	3,940	394	183	1,947	9,575		2,454	427	18,102	18,667	183
2012	3,723	2,652	1,556	288		5,782	5,976	4,298	549	230	2,004	9,917		2,492	568	19,855	19,949	230
2013	4,157	1,976	2,348	292		11,044	4,134	5,656	374	357	5,430	8,224		2,452	565	31,087	15,566	357
2014	3,303	1,020	2,157	32		10,018	1,984	7,227	233	262	4,872	5,490		3,014	384	30,592	9,144	262
2015	4,279	555	2,401	20		12,739	975	4,730	148	101	7,230	3,568		2,948	241	34,327	5,507	101
2016	4,386	420	2,558	30	38	13,581	819	4,031	162	253	6,383	4,810	207	2,223	106	33,162	6,347	499
2017	2,949	2,097	1,414	365	66	7,542	5,853	3,255	217	108	2,209	7,488	192	2,447	177	19,815	16,197	366
2018	4,375	1,529	3,063	291	3	8,932	6,383	3,922	2,054	468	3,699	9,686	0	1,865	188	25,856	20,131	471
2019	2,780	2,162	2,568	318	2	6,648	3,990	2,093	273	567	2,802	9,261	0	1,193	184	18,083	16,188	569
2020	3,151	1,922	2,092	391	21	7,454	4,618	2,440	287	505	4,002	9,690	0	1,396	211	20,536	17,119	526
AVG 93-20	2,710	2,585	2,329	416	26	8,674	4,917	5,313	502	290	3,649	7,732	80	3,104	453	25,780	16,605	133

GW = groundwater, CVP = Central Valley Project, RW = recycled water

1. Subbasin refers to the 1996-defined Subbains

2. Hollister East includes CVP water delivered to the West Hills Treatment Plant in San Juan but supplied to Hollister East customers.

3. Does not include CVP water used for percolation

Table E-3a. Recent Water Use by Subbasin and User Type, Includes Recycled Water (AFY) - Agriculture

Management Area	Subbasin[1]	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Agriculture																	
Hollister	Bolsa SE	2,352	2,517	2,570	2,334	2,252	2,103	3,004	1,837	2,635	2,180	2,417	2,601	1,831	3,315	2,889	2,494
	Hollister East	8,543	9,526	10,685	8,012	6,860	8,315	9,067	9,453	10,832	8,151	8,464	8,784	7,756	9,594	7,673	9,451
	Hollister West	2,128	1,936	2,145	1,509	1,708	1,888	2,190	2,228	3,324	2,584	2,750	2,192	1,338	2,337	1,807	2,145
	Pacheco	4,190	4,469	4,573	3,220	4,304	4,242	4,279	6,148	5,990	4,121	4,658	4,616	4,964	5,663	4,838	4,592
	Tres Pinos	800	1,004	954	655	670	640	471	641	652	514	1,513	572	468	448	276	370
San Juan	San Juan	11,496	12,622	12,185	9,581	12,397	11,960	10,009	10,964	14,376	11,183	13,123	13,826	11,916	14,568	10,134	10,563
	TOTAL	**29,509**	**32,074**	**33,112**	**25,310**	**28,192**	**29,148**	**29,020**	**30,980**	**37,810**	**28,734**	**32,926**	**32,591**	**28,273**	**35,925**	**27,616**	**19,053**

Table E-3b. Recent Water Use by Subbasin and User Type, Includes Recycled Water (AFY) - M&I

Management Area	Subbasin[1]	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
M&I																	
Hollister	Bolsa SE	12	8	7	13	9	0	6	6	4	9	5	25	14	43	0	9
	Hollister East[2]	3,241	3,280	3,203	2,742	2,570	2,307	2,594	2,608	2,961	2,277	2,334	2,617	2,132	3,790	4,389	4,242
	Hollister West	3,636	3,168	3,361	3,265	2,710	2,555	2,235	2,710	2,796	5,072	2,229	2,254	2,242	4,106	1,126	1,086
	Pacheco	235	234	293	248	323	83	133	227	144	203	176	191	81	241	104	481
	Tres Pinos	2,220	2,336	2,748	2,581	2,648	1,534	2,410	2,710	2,365	2,884	1,676	1,757	2,156	1,606	1,101	1,238
San Juan	San Juan	1,356	1,320	1,640	1,375	1,164	1,053	601	793	803	820	590	574	1,479	747	504	1,510
	TOTAL	**10,700**	**10,345**	**11,252**	**10,225**	**9,424**	**7,532**	**7,979**	**9,055**	**9,073**	**11,263**	**7,010**	**7,417**	**8,105**	**10,533**	**7,225**	**7,056**

1. Subbasin refers to the 1996-defined Subbains
2. Hollister East includes 1,990 AF of CVP water delivered to the West Hills Treatment Plant in San Juan but supplied to Hollister East customers.

Table E-4. Historical Water Use by User Type in Zone 6 - Includes Recycled Water (AFY)

WY	Agricultural	Municipal, and Industrial	Total	% Ag
1988	46,366	5,152	51,518	90%
1989	32,387	6,047	38,434	84%
1990	49,663	5,725	55,388	90%
1991	46,640	7,631	54,271	86%
1992	32,210	6,912	39,122	82%
1993	38,878	5,066	43,944	88%
1994	41,854	7,186	49,040	85%
1995	36,399	8,272	44,671	81%
1996	39,845	8,131	47,976	83%
1997	41,482	11,068	52,550	79%
1998	27,526	8,605	36,131	76%
1999	37,203	10,066	47,269	79%
2000	36,062	10,764	46,826	77%
2001	34,035	10,640	44,675	76%
2002	34,354	11,300	45,654	75%
2003	33,533	11,159	44,692	75%
2004	35,597	11,898	47,495	75%
2005	29,510	10,699	40,209	73%
2006	32,074	10,456	42,530	75%
2007	33,112	13,311	46,424	71%
2008	25,310	10,225	35,535	71%
2009	28,192	9,424	37,616	75%
2010	29,148	7,531	36,679	79%
2011	29,020	7,932	36,952	79%
2012	30,980	9,055	40,095	77%
2013	37,810	9,073	46,653	81%
2014	28,734	11,226	39,960	72%
2015	32,926	7,161	39,935	82%
2016	32,591	7,417	40,008	81%
2017	28,273	8,105	36,012	79%
2018	35,925	10,533	46,458	77%
2019	27,616	7,225	34,841	79%
2020	29,616	8,565	38,181	78%
AVERAGE	**34,390**	**8,896**	**43,265**	**79%**

Table E-5. Municipal Water Use by Major Purveyor for Water Year 2020 (AF)

	WY 2020	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Groundwater													
Sunnyslope CWD	**694**	26	29	17	68	34	52	45	61	75	87	122	78
City of Hollister	**707**	106	23	56	21	15	29	27	81	82	72	106	90
City of Hollister - Cienega Wells	**95**	8	6	8	8	8	8	8	8	8	8	9	9
San Juan Bautista	**224**	25	15	15	16	19	13	10	15	16	26	23	32
Tres Pinos CWD	**35**	3	3	2	2	2	2	3	3	4	3	4	4
Groundwater Subtotal	**1,755**	**169**	**75**	**97**	**115**	**78**	**104**	**92**	**168**	**185**	**196**	**264**	**213**
CVP Imported Water													
Lessalt Treatment Plant	**1,503**	171	145	114	60	95	142	116	132	162	151	108	107
West Hills Treatment Plant	**1,990**	140	124	127	124	113	124	142	202	207	230	277	179
Imported Water Subtotal	**3,493**	**311**	**269**	**241**	**185**	**208**	**266**	**258**	**334**	**369**	**381**	**385**	**286**
Municipal Total													
TOTAL Municipal Water Supply	**5,248**	**480**	**344**	**338**	**299**	**286**	**370**	**350**	**502**	**553**	**578**	**649**	**499**

0.66551726

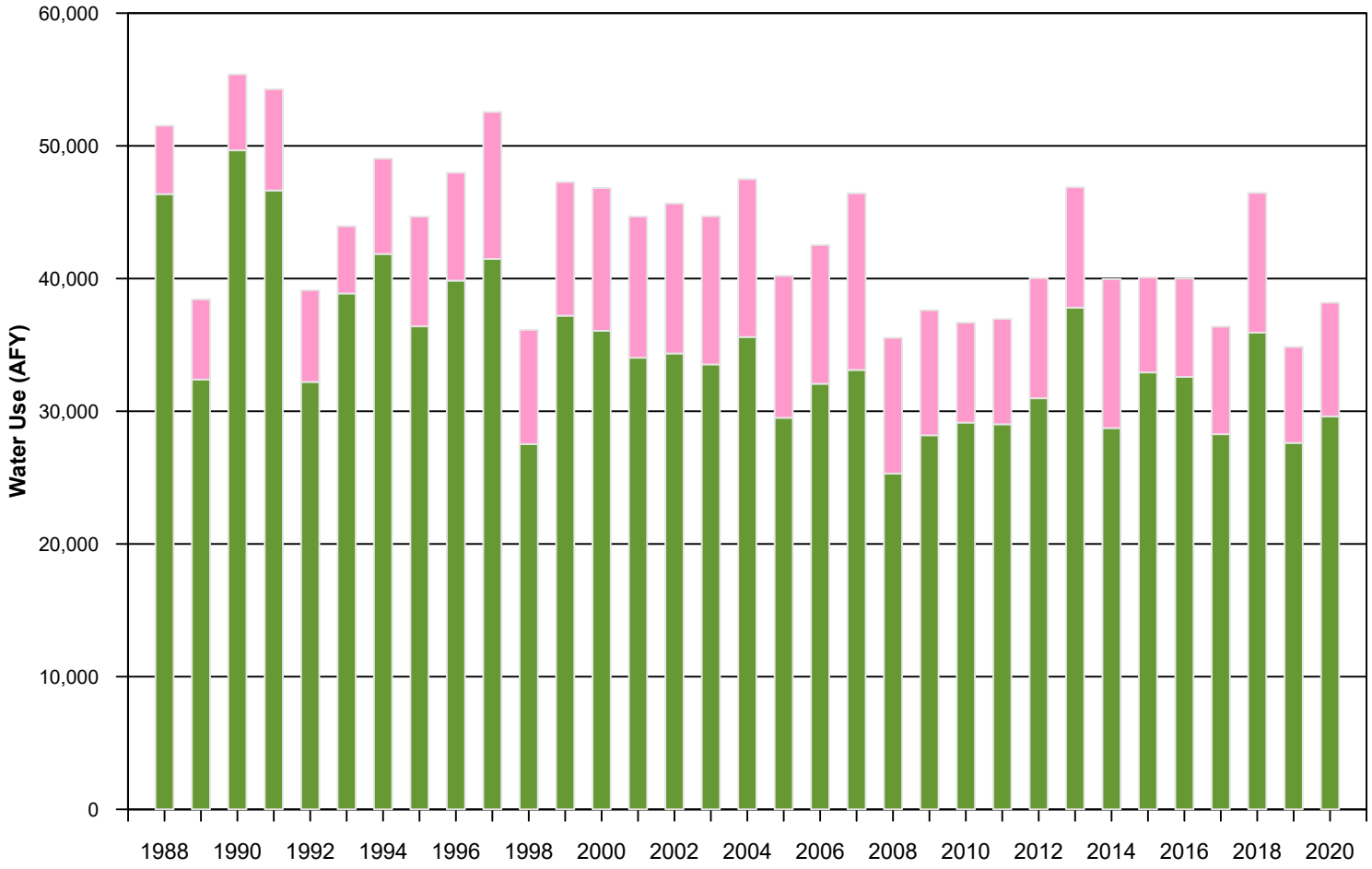
Todd Groundwater 12/14/2020

Table E-6. Historical Municipal Water Use by Major Purveyor (AFY)

WY	Sunnyslope CWD - GW	City of Hollister - GW	City of Hollister - Cienega Wells[1]	San Juan Bautista	Tres Pinos CWD	Lessalt Treatment Plant	West Hills Treatment Plant	Undivided Total	TOTAL
1988						0	0	5,152	5,152
1989						0	0	6,047	6,047
1990						0	0	5,725	5,725
1991						0	0	7,631	7,631
1992						0	0	6,912	6,912
1993						0	0	5,066	5,066
1994						0	0	7,186	7,186
1995	2,167	2,446				0	0		4,613
1996	2,139	3,386				0	0		5,525
1997	2,638	3,848				0	0		6,486
1998	2,357	3,441				0	0		5,798
1999	2,820	3,558				0	0		6,378
2000	3,214	4,021				0	0		7,235
2001	3,290	3,851				0	0		7,141
2002	3,256	4,120				21	0		7,398
2003	2,053	2,754				2,494	0		7,302
2004	2,426	2,828				2,101	0		7,356
2005	1,959	3,147	123	247	49	1,843	0		7,368
2006	1,907	2,801	123	150	49	1,900	0		6,930
2007	2,413	2,758	123	47	49	1,719	0		7,108
2008	2,294	2,746	123	417	47	1,323	0		6,949
2009	2,251	2,503	123	373	47	1,212	0		6,509
2010	1,861	2,194	108	308	47	1,344	0		5,861
2011	2,225	1,651	80	292	47	1,593	0		5,887
2012	2,360	1,761	130	267	45	1,657	0		6,219
2013	1,655	2,655	120	281	46	1,648	0		6,405
2014	2,134	2,646	114	285	49	979	0		6,207
2015	1,348	1,960	114	225	49	1,364	0		5,060
2016	1,331	1,615	105	232	49	1,682	0		5,014
2017	1,449	1,543	79	249	32	1,940	51		5,344
2018	978	1,217	121	184	34	1,596	1,990		6,119
2019	565	588	283	257	33	1,660	2,524		5,912
2020	694	707	95	224	35	1,503	1,990		5,248

1. Data from Hollister Cienega Wells for 2005-2008 was estimated to be the same as WY 2009
Cells with no data indicate that the information is unavailable, while years with no use are shown explicitly as 0's.

Todd Groundwater 12/15/2020



Agriculture

Groundwater

December 2020

TODD GROUNDWATER

Appendix E-1
Agricultural and Municpal Water Use

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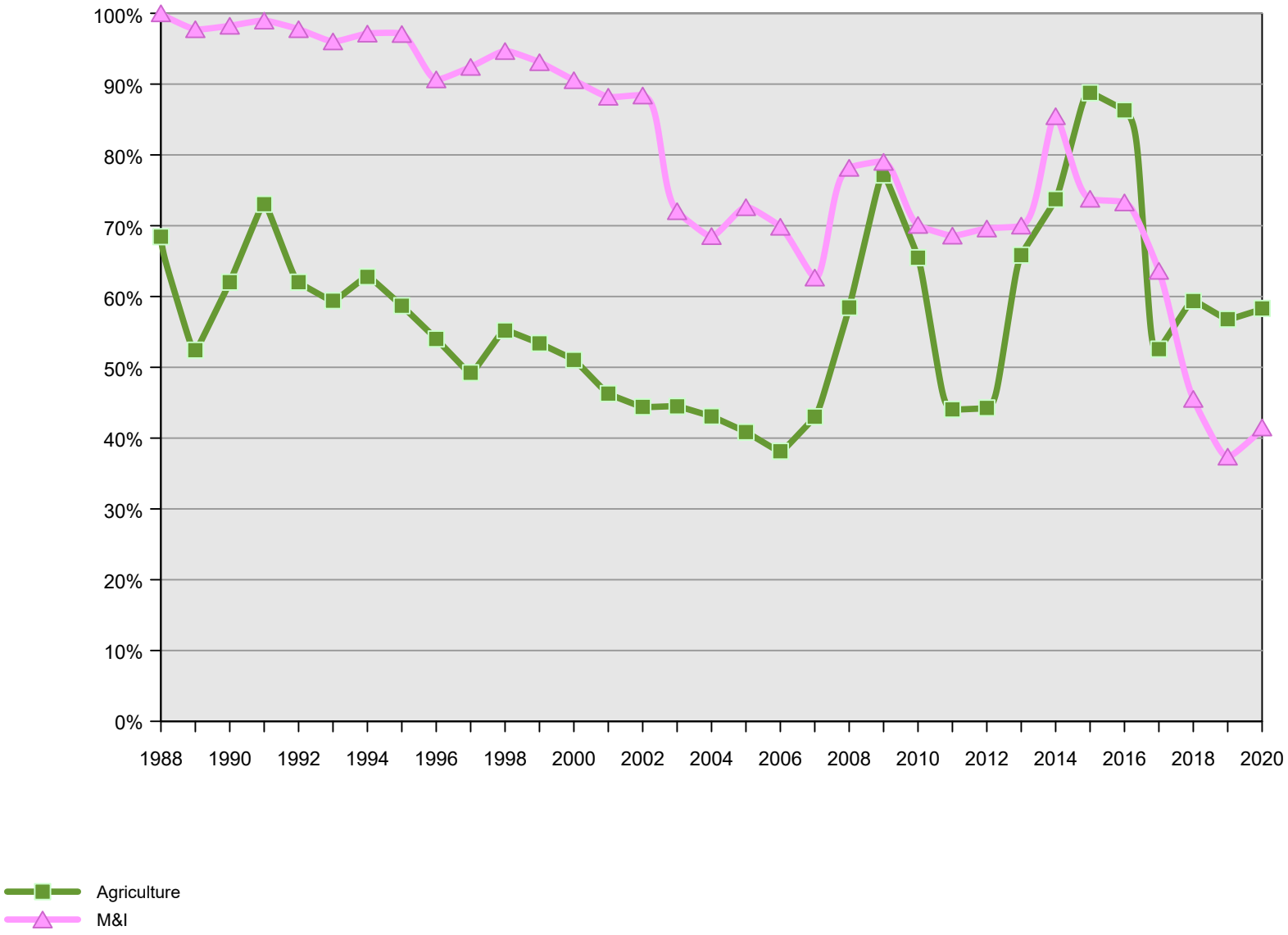

December 2020

TODD GROUNDWATER

Appendix E-2
Water Use in Zone 6
by Source

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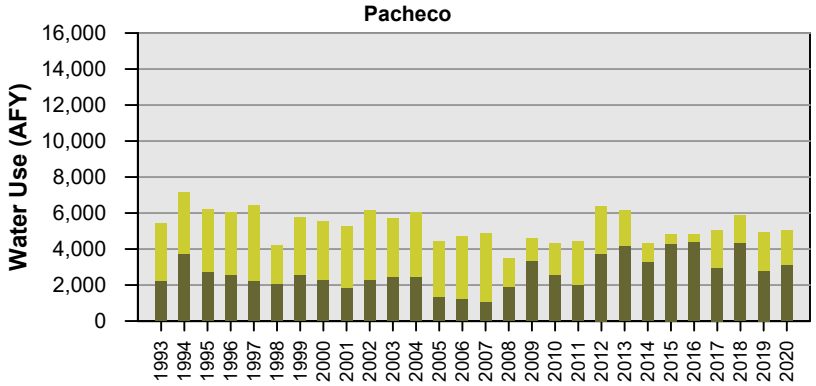

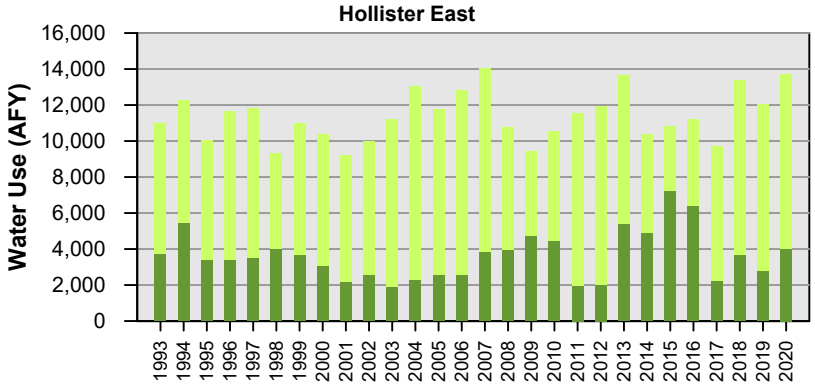

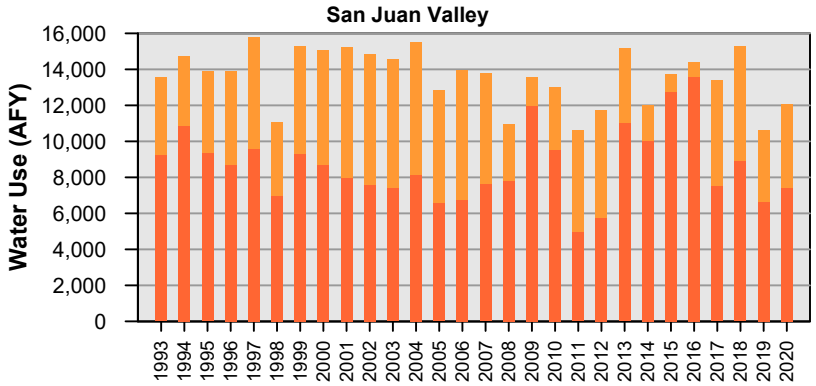

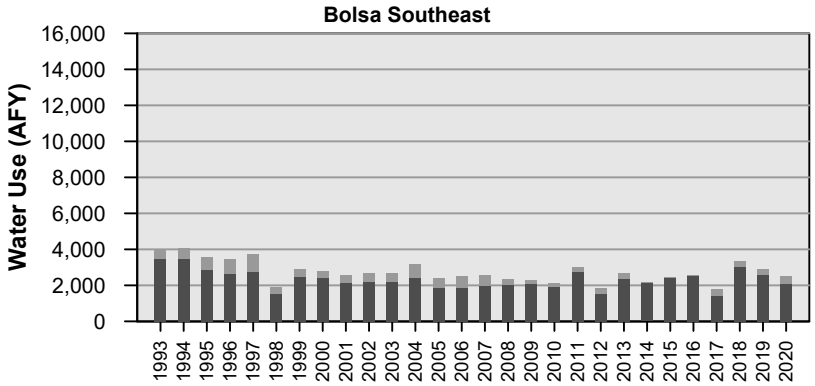

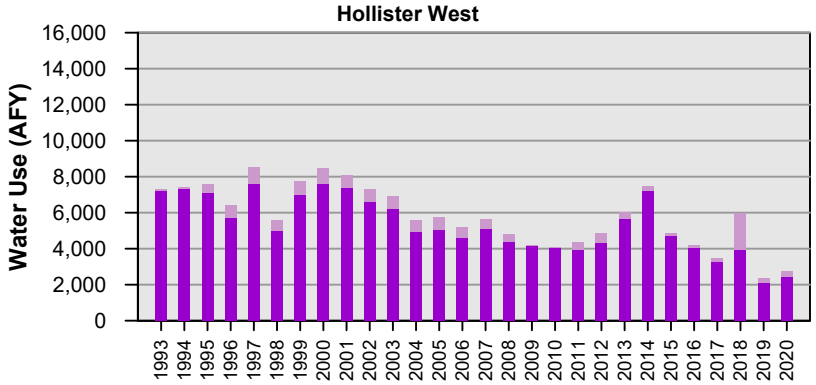

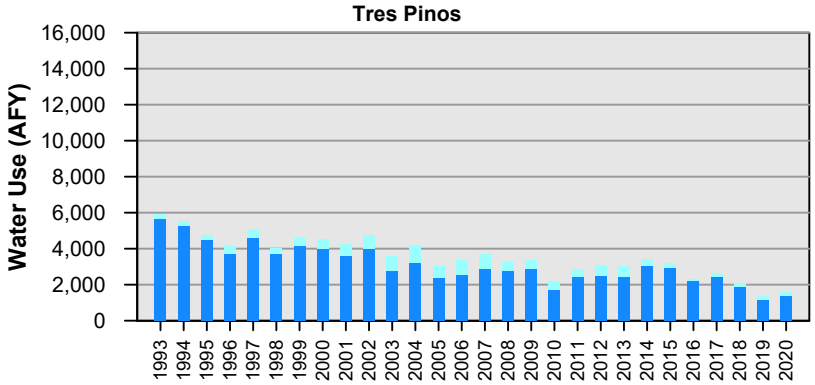

CVP water (lighter shade typ.)

Groundwater (darker shade typ.)

December 2020

TODD GROUNDWATER

Appendix E-3
Total Subbasin Water Use by Water Type

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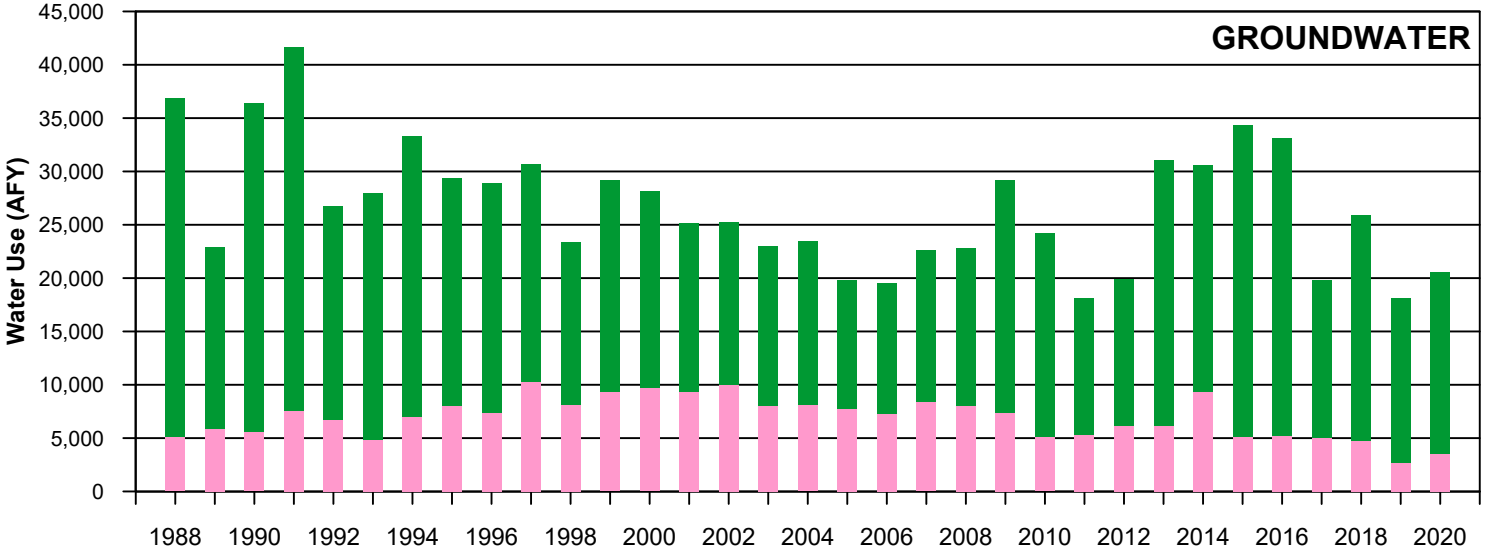

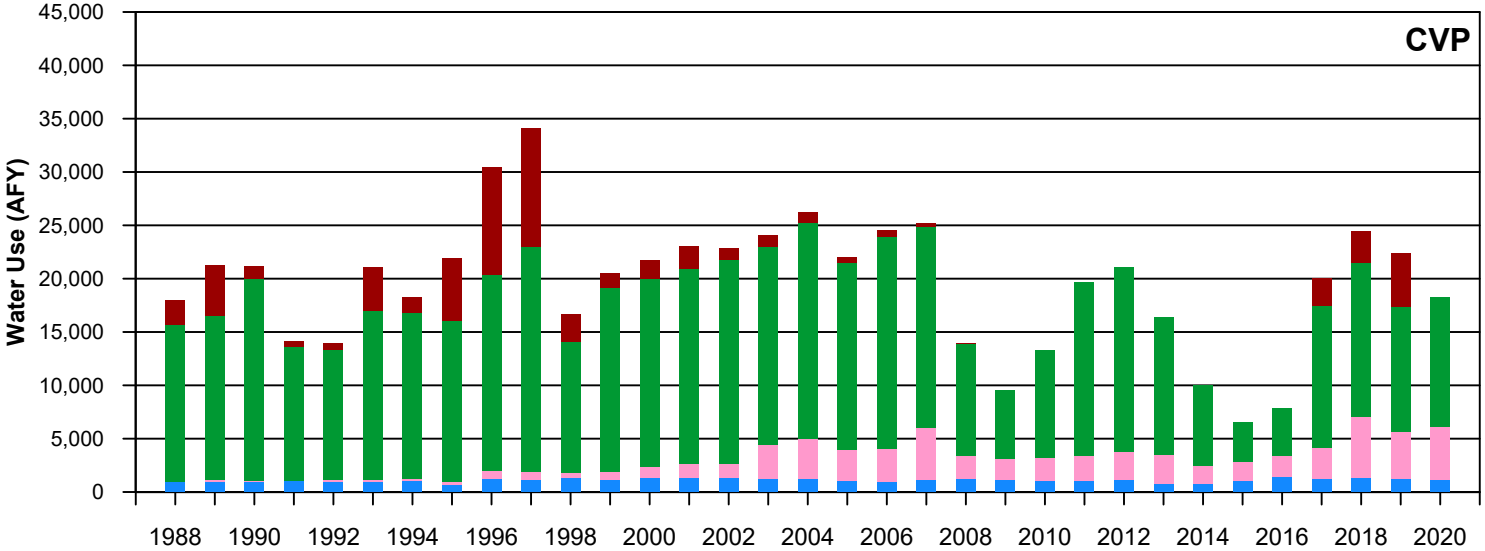

Percolation
Agricultural
Domestic & Municipal
Seepage & Evaporation

December 2020

TODD GROUNDWATER

Appendix E-4
Annual Total of CVP and Groundwater by Use

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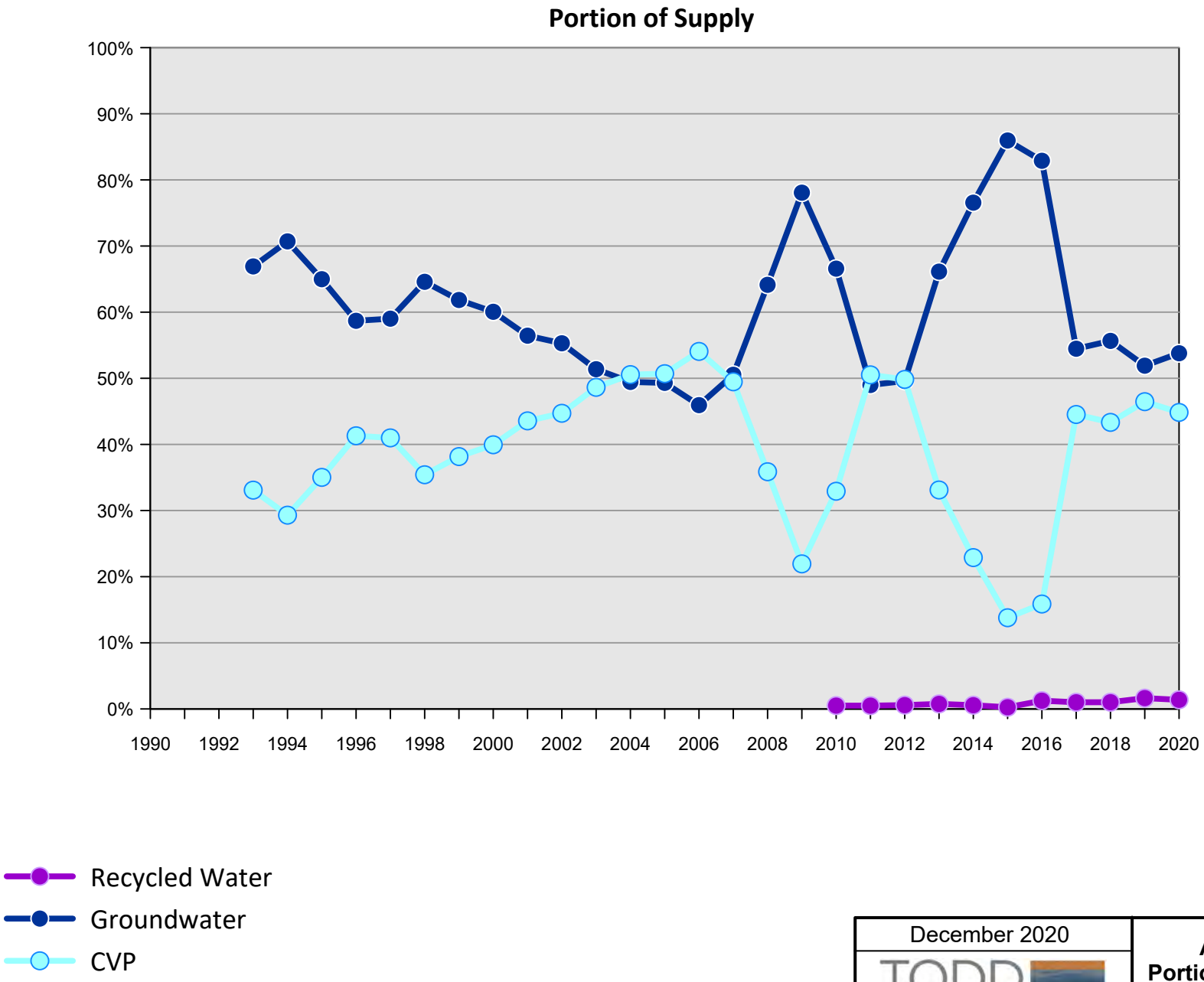

December 2020

TODD GROUNDWATER

Appendix E-5
Portion of Total Supply from Groundwater Use

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Table F-2. Historical and Current San Benito County Water District CVP (Blue Valve) Water Rates

Table F-3. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

Table F-1. 2019 Recommended Groundwater Revenue Requirement/Charges

San Benito County Water District
Groundwater Rates
Water Year
2019-2020, 2020-2021, 2021-2022
Zone 6

REVENUE REQUIREMENTS				Rates[2]	
Component	**Rate ($/AF)**	**Quantity (A/F)[1]**	**Amount**	**Ag** (per A/F)	**M & I** (per A/F)
SOURCE OF SUPPLY O&M					
AG	$ 18.68	23,974	$ 447,851	$ 18.68	
M&I	$ 18.68	4,877	$ 91,110		$ 18.68
PERCOLATION COSTS					
Cost of Water					
AG Cost of Water[3]	$ 53.51	2,105	$ 112,612	$ 4.70	
M&I Cost of Water[3]	$ 163.58	428	$ 70,036		$ 14.36
Power Costs					
AG Power Charge for percolation	$ 58.83	2,105	123,812	$ 5.16	
M&I Power Charge for percolation	$ 58.83	428	25,188		$ 5.16
TOTAL				$ 28.54	$ 38.21
Current Groundwater Charge[4] (per acre foot)				$ 7.95	$ 24.25
RECOMMENDED Rate Basis (per acre foot)					
Water Year 2019-2020				**$ 12.74**	**$ 38.21**
Water Year 2020-2021				**$ 13.12**	**$ 39.36**
Water Year 2021-2022				**$ 13.51**	40.54
RECOMMENDED CHARGES (per acre foot)				**$ 12.75**	38.25
Water Year 2019-2020				**$ 13.15**	39.40
Water Year 2020-2021				**$ 13.55**	40.55
Water Year 2021-2022					

Notes:

1 Assumed Volumes
Groundwater usage (based on average of past 4 years)

Ag usage	23,974
M&I usage	4,877
Total	28,851

2 Rates=Revenue Requirements/projected groundwater usage
3 Cost of Water:
AG: USBR and SLDMWA O&M
M&I: USBR and SLDMWA O&M, USBR Out-of-Basin Interest
4 Groundwater charge adopted by San Benito County Water District Board of Directors in January 2017 (Ag) and January 2016 (M&I)
5 Assumed volumes for percolation (based on 3 year average)

Ag	83%	2105
M&I	17%	428
Total	100%	2533

6 Annual escalation rate 3%
7 Rates charged will be rounded up to nearest $.05

Note: Section 70-7.8 (a) of the District Act states that the agricultural rate shall not exceed one-third of the rates for all water other than agricultural water.

Table F-2. Historical and Current San Benito County Water District CVP (Blue Valve) Water Rates (dollars/af)

USBR Water Year	Standby & Availability Charge (dollars/acre)	Water Charge		Power Charge					Groundwater Charge (dollars/af)			Recycled Water (per AF)	
		Agricultural	Municipal & Industrial	Distribution Subsystem					Agricultural	Municipal & Industrial		Agricultural	Power Charge
				2	6H	9L	9H	Others					
1987	$8.00	$34.00	n.c.						n.i.	n.i.			
1988	$2.00	$34.00	n.c.						n.i.	n.i.			
1991	$4.00	$38.00	$110.00						$6.25	$22.00			
1992	$4.00	$45.00	$120.00						$2.00	$10.00			
1994	$4.50	$77.61	$168.92						$1.00	$5.00			
1995	$4.50	$77.61	$168.92						$1.00	$15.75	First 100 af		
										$36.70	Next 500 af		
										$54.60	Over 600 af		
1996	$6.00	$75.00	$150.00						$1.50	$33.00			
1997	$6.00	$75.00	$157.00						$1.50	$33.00			
1998	$6.00	$75.00	$155.00						$1.50	$33.00			
2000	$6.00	$75.00	$155.00						$1.50	$11.50			
2001	$6.00	$75.00	$155.00						$1.50	$25.00			
2004	$6.00	$75.00	$150.00	$24.30	$46.75	$25.05	$53.70	$15.25	$1.50	$10.00			
2005	$6.00	$80.00	$150.00	$26.15	$49.40	$35.00	$66.90	$17.10	$1.50	$21.50			
2006	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50			
2007	$6.00	$85.00	$160.00	$23.60	$36.05	$34.70	$65.75	$18.40	$1.50	$21.50			
2008	$6.00	$100.00	$170.00	$17.25	$19.40	$32.60	$62.75	$14.85	$1.50	$21.50			
2009	$6.00	$115.00	$180.00	$17.50	$20.25	$42.55	$74.85	$16.30	$2.50	$22.50			
2010	$6.00	$135.00	$200.00	$22.00	$27.30	$49.75	$84.35	$21.75	$2.50	$22.50			
2011	$6.00	$155.00	$220.00	$22.70	$28.15	$51.25	$86.90	$22.40	$2.50	$22.50			
2012	$6.00	$170.00	$235.00	$23.35	$29.00	$52.80	$89.50	$23.10	$2.50	$22.50			
2013	$6.00	$170.00	$235.00	$40.30	$29.25	$43.05	$91.55	$22.40	$3.25	$23.25			
2014	$6.00	$170.00	$238.00	$41.55	$30.15	$44.35	$94.30	$23.10	$3.60	$23.25			
2015	$6.00	$179.00	$247.00	$42.75	$31.05	$45.70	$97.15	$23.80	$3.95	$23.25			
2016	$6.00	$272.00	$363.00	$123.10	$75.65	$109.95	$162.55	$66.05	$4.95	$24.25		$182.55	$57.70
2017	$6.00	$191.00	$363.00	$126.80	$77.90	$113.25	$167.45	$68.05	$6.45	$24.25		$183.45	$59.45
2018	$6.00	$209.00	$363.00	$130.60	$80.25	$116.25	$172.45	$70.10	$7.95	$24.25		$183.45	$59.45
2019	$6.00	$254.00	$404.00	$80.45	$39.30	$88.15	$130.30	$33.70	$12.75	$38.25		$183.45	$59.45
2020	$6.00	$265.00	$415.00	$82.85	$40.45	$90.80	$134.10	$34.75	$13.15	$39.40		$208.00	$60.64

Notes:
af = acre-feet.
n.c. = no classification.
n.i. = not implemented
All rates effective March 1 through following February.

Table F-3. Recent US Bureau of Reclamation Charges per Acre-Foot for CVP Water

User Category and Cost Item	Irrigation[1]						Municipal & Industrial					
	Cost of service (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]	Cost of service[2] (non-full cost)	Restoration fund[3]	SLDMWA[4]	Trinity PUD Assessment	Total	Contract rate[5]
1994	$71.68	$6.20	n.a.		$77.88	$17.21	$165.67	$12.40	n.a.		$178.07	$85.86
1995	$66.47	$6.35	n.a.		$72.82	$17.21	$132.90	$12.69	n.a.		$145.59	$85.86
1996	$65.63	$6.53	n.a.		$72.16	$27.46	$127.40	$13.06	n.a.		$140.46	$85.86
1997	$69.57	$6.70	n.a.		$76.27	$27.46	$143.27	$13.39	n.a.		$156.66	$85.86
1998	$61.58	$6.88	$5.00		$73.46	$27.46	$130.88	$13.76	$5.00		$149.64	$85.86
1999	$60.30	$6.98	$2.73		$70.01	$27.46	$127.91	$13.96	$2.73		$144.60	$85.86
2000	$64.24	$7.10	$6.43		$77.77	$27.46	$129.59	$14.20	$6.43		$150.22	$85.86
2001	$69.50	$7.28	$2.65		$79.43	$27.46	$129.40	$14.56	$4.15		$148.11	$85.86
2002	$68.71	$7.54	$6.61		$82.86	$24.30	$130.32	$15.08	$6.61		$152.01	$79.13
2003	$72.20	$7.69	$5.46		$85.35	$24.30	$129.07	$15.38	$5.46		$149.91	$79.13
2004	$74.52	$7.82	$6.61		$88.95	$24.30	$134.86	$15.64	$6.61		$157.11	$79.13
2005	$77.10	$7.93	$7.99		$93.02	$24.30	$132.01	$15.87	$7.99		$155.87	$79.13
2006	$91.13	$8.24	$9.31		$108.68	$30.93	$214.41	$16.49	$9.31		$240.21	$77.12
2007	$93.53	$8.58	$9.99	$0.11	$112.21	$30.93	$215.32	$17.15	$9.99	$0.11	$242.46	$80.08
2008[6]	$28.12	$8.79	$10.95	$0.07	$47.93	$30.93	$33.34	$17.57	$10.95	$0.07	$61.68	$33.34
2009	$30.20	$9.06	$11.49	$0.07	$50.82	$30.20	$32.77	$18.12	$11.49	$0.07	$62.45	$32.77
2010	$33.27	$9.11	$11.91	$0.11	$54.40	$33.27	$36.11	$18.23	$11.91	$0.11	$66.36	$36.11
2011	$38.92	$9.29	$9.51	$0.05	$57.77	$38.92	$42.58	$18.59	$9.51	$0.05	$70.73	$42.58
2012	$39.71	$9.39	$15.20	$0.05	$64.35	$39.71	$37.95	$18.78	$15.20	$0.05	$71.98	$37.95
2013	$40.39	$9.79	$17.29	$0.05	$67.52	$39.91	$38.71	$19.58	$17.29	$0.05	$75.63	$40.92
2014	$46.87	$9.99	$28.81	$0.23	$85.90	$46.87	$29.70	$19.98	$28.81	$0.23	$78.72	$29.70
2015	$53.82	$10.07	$30.66	$0.23	$94.78	$53.82	$34.74	$20.14	$30.66	$0.23	$85.77	$34.74
2016	$85.12	$10.21	$30.66	$0.30	$126.29	$38.28	$61.24	$20.41	$30.66	$0.30	$112.61	$23.42
2017	$66.17	$10.23	$14.15	$0.30	$90.85	$39.90	$49.50	$20.45	$14.15	$0.30	$84.40	$22.85
2018	$79.09	$10.47	$20.39	$0.30	$110.25	$48.35	$43.74	$20.94	$20.39	$0.30	$85.37	$17.45
2019	$67.32	$10.63	$20.26	$0.30	$98.51	$40.14	$37.54	$21.26	$20.26	$0.30	$79.36	$17.98
2020	$72.24	$10.91	$27.57	$0.12	$110.84	$52.76	$37.18	$21.82	$27.57	$0.12	$86.69	$17.87

Notes:

(1) Total USBR rate given for non-full cost users only, as they represent the majority of water users.

(2) Cost-of-service for agricultural and municipal and industrial users includes a capital repayment rate and an operation and maintenance (O&M) rate. For municipal and industrial customers, cost-of-service also includes a deficit charge, which includes interest on unpaid O&M and interest on capital and on unpaid deficit.

(3) Restoration fund charges apply October 1 through September 30. All other rates effective March 1 through following February.

(4) Beginning in 1998, the San Luis-Delta Mendota Water Authority instituted this charge to "self-fund" costs associated with maintaining the Delta-Mendota Canal and certain other facilities, which were formerly funded directly by the Bureau of Reclamation. SLDMWA issues preliminary rates in December for the upcoming contract year (March-February). These rates are used for rate-setting purposes; actual rates may vary.

(5) The contract rate is the minimum rate CVP contractors are allowed to pay. To the extent that the contract rate does not cover interest plus actual operation and maintenance costs, a contractor deficit is accumulated that is charged interest at the current-year treasury borrowing rate.

(6) Per the amendatory contract with the USBR "out of basin" capital costs that were previously included in the cost of service are now under a separate repayment contract.

(7) Cost of service rates are inclusive of USBR direct pumping and Project Use Energy costs.

APPENDIX G LIST OF ACRONYMS

List of Acronyms

AF or A/F	acre-foot
AFY	acre-foot per year
AG	agriculture
BMP	Best Management Practices
CASGEM	California Statewide Groundwater Elevation Monitoring
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
COC	Constituent of Concern
CVP	Central Valley Project
District or SBCWD	San Benito County Water District
CWD	County Water District
DDW	Division of Drinking Water
DWR	California Department of Water Resources
DWTP	Domestic Wastewater Treatment Plant
ET	evapotranspiration
ft	feet
GAMA	Groundwater Ambient Monitoring and Assessment
GICIMA	Groundwater Information Center Interactive Map
GPBO	General Basin Plan Objective
gpd	gallons per day
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GW	groundwater
HUA	Hollister Urban Area
IRWMP	Integrated Regional Water Management Plan
ITRC	Irrigation Training and Research Center, California Polytechnic State University
IWTP	Industrial Wastewater Treatment Plant
M&I	Municipal and Industrial
MA	Management Area
MCL	Maximum Contaminant Level
MGD	million gallons per day
msl	mean sea level
MW	Monitored well
NGVD	National Geodetic Vertical Datum
pdf	Adobe Acrobat Portable Document Format
PPWD	Pacheco Pass Water District
PVWMA	Pajaro Valley Water Management Agency
RW	recycled water
RWQCB	Regional Water Quality Control Board

List of Acronyms (cont.)

SCVWD	Santa Clara Valley Water District
SEIR	Supplemental Environmental Impact Report
SGMA	Sustainable Groundwater Management Act
SLDMWA	San Luis & Delta-Mendota Water Authority
SMCL	Secondary Maximum Contaminant Levels
SSCWD	Sunnyslope County Water District
USBR	U.S. Bureau of Reclamation
UWMP	Urban Water Management Plan
WRA	Water Resources Association of San Benito County
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WY	water year

APPENDIX G

Groundwater Model Update and Enhancement 2020 Report

NORTH SAN BENITO BASIN GROUNDWATER MODEL UPDATE AND ENHANCEMENT 2020

March 2020

TODD GROUNDWATER

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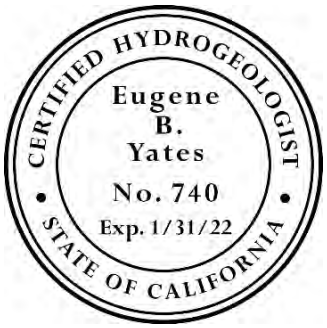

Eugene B. (Gus) Yates, PG, CHG

Senior Hydrologist

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1. INTRODUCTION

In 2001, San Benito County Water District (District) developed a groundwater flow model of the San Benito County part of the Gilroy-Hollister Groundwater Basin. The model has undergone revisions and enhancements to meet the needs of specific projects, most recently in 2014 (Todd Groundwater 2015). Extensive revisions, an update of the calibration period and recalibration have been done in 2019 to meet the needs of two projects: preparation of a groundwater sustainability plan for the North San Benito Subbasin and evaluation of potential impacts of enlarging Pacheco Reservoir. Major elements of this work include:

- Expanding the modeled area to include all of the North San Benito Subbasin of the Gilroy-Hollister Groundwater Basin in San Benito County plus the basin area along Pacheco Creek that extends north into Santa Clara County. This included a major expansion to the southeast, nearly doubling the total model area.
- Implementing a fine, uniform model grid.
- Updating all model input time series data as well as water-level hydrographs used for model calibration through water year 2019.
- Recalibration of the hydraulic characteristics of aquifer materials, stream beds and faults.
- Preparation of hydrologic time series data for model input back to water year 1922 to enable simulation of the 1922-2003 period used for the Pacheco Reservoir Expansion Project design work.
- Change from MODFLOW2000 to MODFLOW2005 and from STR to SFR stream flow module.

This report documents the expanded, updated and recalibrated model, including ancillary modeling steps used to prepare inflows to the groundwater model.

2. BOUNDARIES OF THE BASIN, MODEL AND WATERSHED

The Gilroy-Hollister Groundwater Basin as defined by the California Department of Water Resources (DWR) includes two subbasins: the North San Benito Subbasin (herein Basin) and Llagas Subbasin, and encompasses valley floor and adjacent hilly areas in northern San Benito County and southern Santa Clara County, as shown in **Figure G-1**. The basin consists of unconsolidated to slightly consolidated sediments with primary porosity that store and transmit significant quantities of groundwater. These formations occur not just beneath the valley floor areas but also in some of the adjacent upland areas. Consequently, the basin boundaries are defined by geology and faults, not by topography. For example, the San Andreas Fault forms much of the southeastern boundary of the basin and cuts across hilly terrain southeast of Hollister. However, almost all extraction and use of groundwater occur in the valley floor areas.

The Hollister Valley extends 10 miles northwest from Hollister to the Pajaro River, which is the county line. A broad, flat region on the San Benito County side of the river is known as the Bolsa subarea. Beyond the river, the Llagas Valley and subbasin continue another 15 miles northwest in Santa Clara County and include the cities of Gilroy and Morgan Hill. The San Juan Valley trends west from Hollister along the San Benito River and includes the City of San Juan Bautista. It is separated from the Bolsa subarea by the Lomerias Muertas and Flint Hills, which are an upward fold of Purisima Formation that rises as much as 1,100 feet above the valley floor areas. The Purisima Formation also makes up the hills along the southern edges of the San Juan and Hollister Valleys, but it is truncated by the San Andreas

Fault. The basin extends southeast of Hollister 25 miles up the valleys associated with Tres Pinos Creek and the San Benito River. Except for the relatively small Paicines and Tres Pinos Creek Valleys, that region is mostly hilly upland areas with hydrogeologic characteristics similar to those of the hills farther north.

The area simulated by the groundwater model includes the entire Gilroy-Hollister Basin in San Benito County plus alluvium beneath Pacheco Creek in Santa Clara County. The Llagas Subbasin is represented as a gradient-dependent groundwater inflow boundary.

Water enters the basin as surface runoff and subsurface inflow from watersheds draining the Diablo Range bordering the eastern edge of the basin and the Gabilan Range bordering the southwestern edge. To develop estimates of surface and subsurface inflows from these tributary areas to the groundwater basin, a rainfall-runoff-recharge model is used to simulate the entire watershed tributary to the Basin. This model simulates all near-surface hydrologic processes, including rainfall, runoff, infiltration, evapotranspiration, effects of impervious areas and irrigation, soil moisture storage and percolation to stream base flow and deep groundwater recharge.

3. BASIN GEOLOGY AND STRUCTURE

3.1. BASIN FILL GEOLOGY

The geologic materials that comprise the basin fill are non-marine sediments of Pliocene age or younger (less than 5 million years old). Some deposits are named, others are referenced simply by age. Data from exploratory oil wells indicate that basin fill sediments extend as much as 4,000 feet below the ground surface near the center of the basin, far beyond the depths of water supply wells (Kilburn, 1972). **Figure G-2** shows a map of the geologic materials exposed at the land surface (CGS, 2002). In the valley floor areas, surficial deposits consist of relatively young alluvium, generally less than 200 feet thick. Most of the basin fill consists of Pliocene and Pleistocene age clays, silts, sands and gravels, including the Purisima Formation. These formations are exposed at the land surface in the hills surrounding the valleys. In the eastern and southeastern parts of Hollister Valley, semi-consolidated deposits are encountered in the subsurface that yield little groundwater and are commonly referred to as the San Benito Gravels of Lawson 1895.

The basin is structurally complex. The substantial depth of the basin and the current topography of the land surface resulted in part from folding of the geologic deposits. For example, the high hills that separate the Bolsa area from the San Juan Valley are associated with the Sargent anticline (upward fold).

3.2. FAULTS

Basin fill materials are cut by several faults that can be mapped on the basis of surface geology and/or their effects on groundwater levels. The most prominent of these is the Calaveras Fault, which bisects the Hollister Valley from northwest to southeast. It offsets hills west of the Hollister Airport and created San Felipe Lake at the north end of the valley (a sag pond). It acts as a barrier to the generally westward movement of groundwater, resulting in flowing wells and perennial stream base flow on the east side of the fault in the northern part of the valley. Geologic mapping as well as groundwater level data indicate that the fault consists of several parallel splinters.

The Ausaymas Fault (Quien Sabe Fault on some maps) crosses the northeastern part of Hollister Valley (see Figure G-2). It created a series of low hills in the valley floor area near Orchard Road and Comstock Road, and it also acts as a barrier to groundwater flow. It trends from the mouth of Pacheco Creek valley toward Santa Ana valley, but geologic maps generally show it disappearing before it gets there. Based on model calibration efforts for this study, there is hydrologic evidence (abrupt changes in groundwater levels) that a branch of the fault might trend southeast toward the southern part of Hollister. This branch is included in the groundwater model.

The Tres Pinos Fault is shown on some geologic maps (see Figure G-2) curving northwest from the town of Tres Pinos along Highway 25 toward Hollister (for example, Kilburn, 1972). There is some water-level evidence that the fault is present, and it is also included in the groundwater model.

Faulting is also associated with the Sargent Anticline in the Lomerias Muertas and Flint Hills. There is a barrier to groundwater flow that crosses the narrow gap of alluvium between the eastern end of the Flint Hills and the low hills of exposed Plio-Pleistocene materials in Hollister. That barrier is included as a fault in the groundwater model.

4. MODELING SOFTWARE AND DIGITAL FILE AVAILABILITY

The computer program used to simulate groundwater flow continues to be MODFLOW 2005, which is public-domain software developed by the U.S. Geological Survey (Harbaugh, 2005). The various versions of MODFLOW are the most widely used groundwater modeling software in the United States. Several commercially available (proprietary) software programs were used to prepare model input and evaluate model output. These include Microsoft Excel, Groundwater Vistas, and ArcGIS. Finally, the rainfall-runoff-recharge model and several pre-processing utility programs were developed in the Fortran 90 programming language by Todd Groundwater.

Readers interested in obtaining input files for the rainfall-runoff-recharge model and groundwater model, or the files used to produce figures in this documentation may obtain them from the District:

San Benito County Water District
30 Mansfield Road
Hollister, CA 95024
Tel. 831-637-8218
Attn. Jeff Cattaneo, Sara Singleton or Garrett Haertle

5. MODEL GRID AND LAYERS

MODFLOW uses a finite-difference numerical method that requires a rectilinear grid of model cells. In plan view, the model grid contains 200 rows by 271 columns of cells. The spacing between rows is uniformly 500 feet. The spacing between columns is 500 feet in the main Basin area and 1,000 feet in the southeastern part of the Basin, as shown in **Figure G-3**. The larger grid spacing in that region reflects the lack of pumping stresses and water-level data in that area.

The model has five layers numbered 1 through 5 from top to bottom. In most areas, the layers simply represent depth intervals within the basin and do not correspond to identifiable geologic features. Where upward water-level gradients are present, layer 2 is used to represent the low-permeability clay and silt layers that restrict vertical flow. Individual gravel, sand, silt and clay layers within the basin tend to be thin and of limited areal extent. Previous studies have had limited success correlating layers between wells on the basis of well completion reports prepared by drillers. This could be due to inconsistent use of lithologic descriptors by drillers, the difficulty in identifying clay layers when drilling with the mud-rotary method (the most common method), and/or actual discontinuity of layers over short distances. Recent re-analysis of geologic information for the Groundwater Sustainability Plan (see Section 3.6) reached the same conclusion.

The top of the basin and the groundwater model is the land surface. Elevation points every 10 meters were extracted from the National Elevation Dataset to define the top of layer 1 (http://ned.usgs.gov). The bottom of the model grid was set at a depth slightly below the depth of most water supply wells. Because of layering within the basin fill sediments, groundwater at depths much greater than water

supply wells tends to remain inactive and has little effect on water levels and flow in the overlying, actively-pumped aquifers. The bottom elevation of layer 1 was carefully selected as a surface slightly below the minimum historical water level recorded during water years 1975-2017. This had the advantage of preventing layer 1 cells from going dry during the calibration simulation but the disadvantage of creating a thick top layer in some places, which decreased the ability to simulate vertical gradients precisely. Dry cells cannot be included in the mathematical operations used to simulate groundwater flow, so cells are permanently removed from the active flow domain if they go dry. Other versions of MODFLOW are available that can simulate unsaturated and saturated conditions concurrently. This keeps all cells active, but at the cost of substantially increased model run time.

The thicknesses of layers 2 through 5 are constant throughout the modeled area, so their bottom elevations have the same shape as the bottom of layer 1 but at a lower elevation. Layer 2 is only 20 feet thick, which serves two purposes. It allows more realistic simulation of salt concentrations near the water table, because salt loads from the ground surface are not averaged over a large depth interval. Also, layer 2 is used in some locations to represent fine-grained layers that create confined conditions and upward water-level gradients. Layers 3, 4 and 5 are 120 feet, 180 feet and 260 feet thick, respectively. Thus, the total saturated thickness represented by the model is about 600-780 feet, depending on the saturated thickness of layer 1 at any given place and time. **Figures G-4 and G-5** show cross sections of the model grid along row 98 and column 76, respectively, to illustrate the shapes and relative thicknesses of the layers.

6. SIMULATION PERIOD AND TIME STEPS

The model calibration period was updated to simulate the historical period of water years 1975-2017. This 43-year period is desirable for model calibration purposes because it includes a wide range of hydrologic and water use conditions. It begins when groundwater levels were low in some parts of the basin due to preceding decades of groundwater overdraft. The low initial water levels were immediately accentuated by the 1976-1977 drought. Water levels generally rose during the wet period of water years 1978-1986 and then declined during the drought of 1987-1992. Recovery from the drought was very rapid due to wet climatic conditions and the beginning of water imports in the early and mid-1990s. In the early years of operation, imported water was actively percolated through creek beds during the dry season as well as used directly for agricultural and urban uses, offsetting groundwater pumping. Water-level recovery was so dramatic that by the late 1990s, wells in some locations began flowing under artesian pressure (that is, without pumping). The calibration period also includes the 2013-2015 drought and most of the subsequent recovery.

The model is transient and advances in monthly time increments. Monthly-average values of inflows and outflows are applied during each of these “stress periods”. Internally, the model subdivides each stress period into three computational time steps that increase in duration from approximately 6 to 14 days. Model inputs related to rainfall recharge and stream recharge were calculated daily using the rainfall-runoff-recharge model, then averaged to monthly values for input to the groundwater model. This is generally more accurate than working directly with monthly values of rainfall and stream flow because runoff and recharge processes are nonlinear.

7. RAINFALL-RUNOFF-RECHARGE MODEL

A rainfall-runoff-recharge model developed by Todd Groundwater was used to prepare estimates of groundwater recharge from rainfall, irrigation, bedrock inflow, and pipe leaks. It also generated the estimates of groundwater use for agricultural irrigation and flows in ungauged streams tributary to or within the basin. The rainfall-runoff-recharge model is built around a soil moisture balance of the root zone, which is simulated continuously using daily time steps for the 43-year calibration period. Numerous variables are involved in the physical processes of rainfall, interception, runoff, infiltration, root zone soil moisture storage, evapotranspiration, irrigation, shallow groundwater storage, recharge of deeper regional aquifers from shallow groundwater, and lateral flow of shallow groundwater into streams. Accordingly, the groundwater basin and tributary watersheds were divided into small recharge zones over which the most influential variables were relatively homogeneous. The daily water balance was then simulated for each zone, and the results aggregated geographically to cells in the groundwater model grid and temporally to the model stress periods.

The rainfall-runoff-recharge model provides several benefits to the groundwater modeling effort:

- It represents the hydrological processes with governing equations that reflect the actual physical processes, at least in a simplified way. This allows sensitivity or suspected errors to be traced to specific assumptions and processes.
- It enforces the principle of conservation of mass on the recharge and stream flow values. Beginning with rainfall, all water mass is accounted for as it moves through the hydrological system.
- It allows additional data sets to be included in model calibration. In tributary watersheds with gauged stream flow data, measured flows can be compared with simulated flows, which consist of the sum of direct runoff and shallow-groundwater seepage to streams. Simulated irrigation frequency can be compared with actual grower practices, and applied irrigation amounts can be compared with water delivery data recorded by the District. Simulated urban irrigation amounts can be compared with seasonal variations in measured urban water use, which are primarily the result of urban irrigation.
- It provides estimates of stream flow in ungauged tributary streams, as well as runoff from valley floor areas within the active model domain.
- It provides estimates of inflow from bedrock and/or upland areas adjacent to the active model domain and constrains the amounts of inflow according to the water balance for each tributary watershed.
- It simulates the effects of runoff from impervious surfaces in urban areas, either to storm drainage systems or to adjacent pervious soils.
- It simulates changes in land use over the 43-year calibration period and the resulting changes in recharge and irrigation demand.
- It combines and parses all of these flows—plus estimated recharge from leaky water and sewer pipes—into recharge values by model cell and stress period in the format required by MODFLOW.

The following sections describe the input data sets and the assumptions and governing equations used to simulate each hydrologic process included in the rainfall-runoff-recharge model.

7.1. LAND USE AND RECHARGE ZONES

Recharge zones were developed by intersecting and editing numerous maps in GIS. The starting point was a map of land parcels in San Benito County current as of 2014. Parcel-based recharge zones are necessary for the San Benito model because the use of imported water use is recorded by parcel. Parcel numbers that changed subsequent to 2014 were linked to the prior parcel locations so that the complete history of imported water use could be simulated seamlessly. The rainfall-runoff-recharge model estimates irrigation pumping by subtracting the use of imported water and recycled water from simulated irrigation demand. Urban parcels were consolidated into zones with relatively homogeneous proportions of irrigated, non-irrigated and impervious land cover, which vary depending on the density and type of urban development. Agricultural parcels were assigned a crop type based on land use surveys by DWR in 1975, 1997 and 2010. Land use in 2014 developed using remote sensing techniques was obtained from DWR. To interpolate smoothly between the years with land use information, parcels with changed land use were each assigned different transition years during the interval between mapping dates.

Parcels were subdivided as needed to reflect the boundaries of agricultural fields. In upland areas of the tributary watersheds, recharge zones were manually delineated into grass, shrub and tree categories based on recent air photos (Google Earth). Those land use polygons were further split if they overlapped a watershed boundary. A few large expanses of grassland in the tributary watersheds were also divided if they spanned a rainfall gradient exceeding 1 in/yr of average annual rainfall. Divisions were also made if recharge zones overlapped two distinctly different soil types. Finally, a few extra polygon divisions were made where necessary to simulate land use changes from earlier years. This process of overlapping, consolidating and splitting polygons resulted in 2,768 recharge zones, of which 23 were in external watersheds with gauged streams that were included for the purpose of calibrating model parameters. A map of the zones and their land uses in 2014 is shown in **Figure G-6.**

Land use in each zone was assigned to one of twenty-one categories. The many types of agricultural crops grown in San Benito County were consolidated into eight groups that reflect distinct root depths, growing seasons or crop coefficients for evapotranspiration. A separate category for small vegetables was used in the Bolsa area, where poor drainage results in a shorter growing season. Natural vegetation was divided into five categories, and urban and developed land uses into seven categories. The categories are listed in **Table G-1** along with their total acreages in 2014 in the groundwater basin management areas and tributary watersheds.

Each land use category is further divided into irrigated, non-irrigated and impervious subareas. These are not explicitly mapped but are expressed as percentages of total zone area. Zones representing irrigated cropland, for example, were mostly assumed to be 92 percent irrigated, with the remainder consisting of farm roads and occasional buffer areas of natural vegetation. Based on examination of aerial photographs, the percent impervious cover in urban land use areas was estimated to be 10 percent for rural residential, 20 percent for urban residential, 70 percent for commercial and 80 percent for industrial. The corresponding percent irrigated area for those categories was estimated to be 10, 13, 10 and 0 percent, respectively.

7.2. RAINFALL

The distribution of average annual rainfall over the basin and tributary watersheds was obtained from PRISM climate modeling (http://www.prism.oregonstate.edu/), shifted uniformly downward slightly so that the modeled value for Hollister matched the long-term average at the Hollister climate station. Also, high simulated values of rainfall in the upper parts of some tributary watersheds were identified as a possible cause of excessively high simulated stream flow. Annual precipitation was adjusted slightly downward in those areas to be more consistent with isohyetal patterns mapped by Rantz (1969) and to match measured stream flow in watersheds with gauges. Each recharge zone was assigned an average annual rainfall value based on its location, as shown in **Figure G-7**.

The surface hydrology model requires daily rainfall as one of two transient inputs. Daily rainfall for the Hollister station during 1975-2014 was used for this purpose, with missing values supplied by correlation with rainfall in Gilroy. Daily rainfall for each recharge zone was calculated as Hollister daily rainfall multiplied by the ratio of zonal average-annual rainfall to Hollister average-annual rainfall.

7.3. INTERCEPTION

Plant leaves intercept some of the rain that falls from the sky, and the amount is roughly proportional to the total leaf area of the vegetation canopy. The estimated interception on each day of rain ranged from zero for industrial, idle and vacant land uses, to 0.03 inch for most crops including turf and 0.06 inch for trees in full leaf. These estimates were inferred from published results of interception studies (Viessman and others, 1977). For each day of the simulation, rainfall reaching the land surface (throughfall) is calculated as rainfall minus interception. Interception storage is assumed to completely evaporate each day and is not carried over from one day to the next.

7.4. RUNOFF AND INFILTRATION

Most throughfall infiltrates into the soil, but direct runoff occurs when net rainfall exceeds a certain threshold. The threshold at which runoff commences and the percent of additional rainfall that runs off are significantly influenced by a number of variables, including soil texture, soil compaction, leaf litter, ground slope, and antecedent moisture. These factors can be highly variable within a recharge zone, and data are not normally available for them. Also, the intercept and slope of the rainfall-runoff relationship depend on the time increment of analysis. Most analytical equations for infiltration and runoff apply to spatial scales of a few square meters over periods of minutes to hours (Viessman and others, 1977). They are suitable for detailed analysis of individual storm events. The curve number approach to estimating runoff also applies to single, large storm events. It is not suitable for continuous simulation of runoff over the complete range of rainfall intensities (Van Mullen and others, 2002). The approach used in the rainfall-runoff-recharge model is similar but less complex than the approach used in popular watershed models such as HSPF (Bicknell and others, 1997).

In the rainfall-runoff-recharge model, daily infiltration is simulated as a three-segment linear function of throughfall, and throughfall in excess of infiltration is assumed to become runoff. The general shape of the relationship of daily infiltration to daily net rainfall is shown in **Figure G-8** (upper graph). Below a specified runoff threshold, all daily throughfall is assumed to infiltrate. Above that amount, a fixed percentage of throughfall is assumed to infiltrate, which is the slope of the second segment of the infiltration function. Finally, an upper limit is imposed that represents the maximum infiltration capacity

of the soil. The runoff threshold, the percentage of excess net rainfall that infiltrates, and the maximum daily infiltration capacity were assumed to vary by land use and were among the variables adjusted for model calibration. The runoff threshold ranged from 0.2 inches per day (in/d) for unpaved areas in industrial and commercial zones to 1.1 in/d for turf and natural vegetation areas. The infiltration percentage for excess rainfall ranged from 55 percent in commercial and industrial areas to 87 percent in large turf areas and upland natural vegetation. The maximum daily infiltration was set to 8 in/d for all land uses and soil types, which for practical purposes puts no upper limit on daily infiltration.

The above parameter values are for soils that are relatively dry. Infiltration rates decrease as soils become more saturated. This phenomenon led to the development of the Antecedent Runoff Condition adjustment factor for rainfall-runoff equations (Rawls and others, 1993). However, application of the concept has been focused on individual storm events. For the purpose of the rainfall-runoff-recharge model, the adjustment provides a means of simulating empirical observations that a given amount of rainfall produces less runoff at the beginning of the rainy season when soils are relatively dry than at the end of the rainy season when soils are relatively wet. This effect is included in the recharge model as a multiplier that decreases the estimated infiltration as soil saturation increases. This multiplier is applied to the runoff threshold, the infiltration slope and the maximum infiltration rate. The multiplier decreases from 1.0 when the soil is dry to a user-selected value between 1.0 and 0.60 when the soil is fully saturated (lower graph in **Figure G-8**). A low value has the effect of decreasing infiltration (and potential groundwater recharge) toward the end of the rainy season or in very wet years, and also to increase simulated peak runoff during large storm events. The multiplier under saturated conditions was assumed to be 0.75 for the San Benito rainfall-runoff-recharge model.

Runoff from impervious surfaces was assumed to equal 100 percent of rainfall. Runoff that flows into a storm drain system (known as “connected impervious runoff”) contributes to stream flow but not groundwater recharge. However, runoff from some impervious surfaces flows onto adjacent areas of pervious soils (“disconnected impervious runoff”). The surface hydrology model treats this type of runoff as if it were a large increment of additional rainfall where it flows over or ponds on the pervious soils. The excess water can quickly saturate the soil and initiate deep percolation. The model incorporates this process by means of a variable representing the fraction of impervious runoff that becomes deep percolation. Data and literature values are not available for this variable. It was estimated to be 10 percent in commercial and industrial areas and 30 percent in residential areas. The study area is not heavily urbanized, so this variable does not strongly influence the water balance or simulation results.

7.5. Root Zone Depth and Moisture Content

The storage capacity of the root zone equals the product of the vegetation root depth and the available water capacity of the soil. The available water capacity for each recharge zone was a depth-weighted average for the dominant soil type, as reported in the soil survey (Natural Resources Conservation Service, 2015). Root depth is a complex variable. Except for cropland, vegetation cover typically consists of a mix of species with different root depths. At a very local scale, roots are deepest directly beneath a plant and shallower between plants. Root density and water extraction also typically decrease with depth within the root zone. To complicate matters, root depth is somewhat facultative for some plants, which means that roots will tend to grow deeper in soils with low available water capacity, such as sands. Finally, root depth in upland watershed areas can be restricted by shallow bedrock.

The root depth selected for each recharge zone essentially represents an average of all these factors. Simulated recharge and stream base flow are both quite sensitive to vegetation root depth, and values were adjusted during the joint calibration of the rainfall-runoff-recharge model and the groundwater flow model. Separate root depths were specified for irrigated and non-irrigated vegetation in each recharge zone. Root depths for turf and crops were required to be the same in all zones. Some variation in rooting depths of natural vegetation among watersheds was introduced while calibrating simulated stream flow to measured stream flow. In general, however, root depths did not appear to be greatly restricted by shallow bedrock in the tributary watershed areas.

7.6. EVAPOTRANSPIRATION

Evapotranspiration is affected by meteorologic conditions, plant type, plant maturity, and soil moisture availability. All of these factors are included in the rainfall-runoff-recharge model. The evaporative demand created by meteorological conditions is represented by reference evapotranspiration (ETo). Numerous equations have been developed over the years relating ETo to solar radiation, air temperature, relative humidity and wind speed. For the purposes of this study, daily values of ETo were obtained from a microclimate station in Hollister that is part of the California Irrigation Management Information System (CIMIS) network. However, those data had to be extrapolated in space and time to obtain values for every recharge zone for the entire 1975-2017 calibration period. Spatially, the study area overlaps two regions in a statewide map of ETo zones prepared by the CIMIS program (Jones, 1999). Most of the study area is in zone 10, but the San Juan Valley is in zone 3 due to the influence of cool marine air that blows inland through Chittenden Gap along the Pajaro River. Annual ETo in zone 3 is 94 percent as large as in zone 10 (46.2 versus 49.1 inches). Accordingly, daily ETo values from the Hollister CIMIS station were multiplied by 0.94 to obtain ETo for zones in the San Juan Valley.

The Hollister CIMIS station began operation in 1994. ETo for each day during water years 1974-1993 was estimated to equal average ETo for the corresponding calendar month multiplied by an adjustment factor derived from the relationship between ETo and air temperature. The factor equaled the slope of a linear regression of ETo versus maximum air temperature for that month of the year, using data from the period of record for the Hollister CIMIS station. Historical daily air temperatures were obtained from the National Oceanic and Atmospheric Administration climate station in Hollister and used to generate the multipliers to convert average monthly ETo to estimated daily ETo.

Vegetation factors are lumped into multipliers called crop coefficients. Reference ET is the amount of water evapotranspired from a broad expanse of turf mowed to a height of 4-6 inches with ample irrigation. ETo is multiplied by a crop coefficient to obtain the actual ET of a different crop or vegetation type at a particular stage in its growth and development. Although primarily used for agricultural crops, crop coefficients can also be applied to urban landscape plants and natural vegetation. Compilations of crop coefficients for many plant types based on field studies are available from numerous sources, in some cases specified by calendar month and in others by growth stage of the plant. Monthly crop coefficients for the 21 land use categories in the surface hydrology model are shown in **Table G-2.** These were developed from a comparison of published values from six sources (Blaney and others, 1963; DWR, 1975; U.N. Food and Agriculture Organization, 2006; Snyder and others, 2007; Williams, 2001; and ITRC, 2003), adjusted to reflect combinations of crops and growing seasons represented by the land use categories. Small vegetables are a dominant crop. Because of their short growing seasons, multiple crops are often grown each year. The monthly crop coefficients reflect a mix of growth stages due to staggered planting of different fields. Based on input from several local growers, the growing season for

small vegetables is March-November in most parts of the basin and April-November in the Bolsa area, where poorly-drained soils delay the planting season. Most fields are bare soil during December-February, and the crop coefficient represents an estimate of evaporation from soils periodically wetted by rain events.

7.7. IRRIGATION

Evapotranspiration gradually depletes soil moisture, and for irrigated areas the rainfall-runoff-recharge model triggers an irrigation event whenever soil moisture falls below a specified threshold. The amount of applied irrigation water is equal to the volume required to refill soil moisture storage to field capacity, divided by the assumed irrigation efficiency. An irrigation threshold equal to 80 percent of maximum soil moisture storage was used for urban landscaping and all crops. This variable primarily affects the frequency of irrigation; a higher threshold results in more frequent irrigation but approximately the same total amount of water applied annually. Irrigation efficiency was assumed to be 75 percent for urban landscaping, reflecting the low application uniformity, overspray and inattention to soil moisture conditions common in residential landscape practice. An efficiency of 85 percent was assumed for all agricultural crops except vineyards, which are drip-irrigated and assigned an efficiency of 95 percent. Regulated deficit irrigation was also applied to vineyards. This is the practice of intentionally water-stressing the vines between veraison and harvest to improve berry quality. The model simulates this by applying only 60 percent of the vineyard ET demand during July-September (Pritchard, 2009).

Because irrigation is assumed to completely refill soil moisture storage and is less than 100 percent efficient, simulated soil moisture exceeds capacity immediately following an irrigation event. The excess is assumed to become deep percolation beneath the root zone.

7.8. DEEP PERCOLATION FROM ROOT ZONE TO SHALLOW GROUNDWATER

The surface hydrology model updates soil moisture storage each day to reflect inflows and outflows. Rainfall infiltration and applied irrigation water are added to the ending storage of the previous day, and ET is subtracted. If the resulting soil moisture storage exceeds the root zone storage capacity, all of the excess is assumed to percolate down from the root zone to shallow groundwater on that day.

7.9. MOVEMENT OF SHALLOW GROUNDWATER TO DEEP RECHARGE AND STREAM BASE FLOW

A shallow groundwater storage component may not be part of all groundwater systems, but its presence is sometimes indicated by groundwater hydrographs and stream base flow. In upland watersheds, for example, the shallow groundwater reservoir is what supplies base flow to streams. Without it, simulated stream flow consists of large flows occurring only on rainy days. Physically, it represents the overall permeability and storage capacity of deep soil horizons and bedrock fractures beneath hillsides bordering a gaining stream. It is the integration of shallow and deep, fast and slow flow paths between the point of rainfall infiltration and the stream. In valley floor areas with flat terrain and deep deposits of unconsolidated basin fill, the presence of a shallow groundwater system is sometimes evident in a lack of response of deep well hydrographs to rainfall recharge events or even wet versus dry years. The shallow zone in that case attenuates the pulses of recharge percolating beneath the root zone into a relatively steady recharge flux, and there may be little outflow to streams.

In the surface hydrology model, the only inflow to shallow groundwater storage is deep percolation from the root zone. There are two outflows: laterally to a nearby creek and downward to the regional groundwater flow system. Outflow to streams is specified as a certain percentage of current groundwater storage, which results in a first-order logarithmic recession of stream base flow, consistent with gaged stream flows. Outflow to the regional groundwater system is simulated as a constant downward flux. This is consistent with flow across confining layers in which the vertical head gradient is near unity. Both outflows are calculated and subtracted from shallow groundwater storage each day. They continue until the storage has been exhausted, resuming whenever a new influx of deep percolation from the root zone arrives. There is no assumed maximum capacity of shallow groundwater storage.

The two parameters defining shallow groundwater flow are the recession constant for flow to streams and the constant downward flow rate for deep recharge. Both of these are obtained by calibration. The recession constant can generally be calibrated by matching simulated to measured stream base flow in gaged watersheds. The deep recharge rate can be used to adjust the long-term partitioning of shallow groundwater mass into base flow versus recharge.

The shallow groundwater component of the surface hydrology model is simple but adequate to capture the fundamental behaviors of logarithmic stream base flow and attenuated deep recharge. Other watershed models invoke more complex systems of storage and flow to simulate these processes. For example, the Precipitation and Runoff Modeling System (PRMS) developed by the U.S. Geological Survey includes a total of seven storage components between the point where a rain drop reaches the ground and the stream into which it ultimately flows (Markstrom and others, 2015). This larger number of components and parameters enables relatively detailed matching of observed stream flow hydrographs but is unnecessarily complex for the purposes of groundwater modeling.

7.10. Calibration of Rainfall-Runoff-Recharge Model

The primary basis for calibrating the rainfall-runoff-recharge model was a comparison of measured and simulated daily stream flow at four gauge locations: Tres Pinos Creek, Cedar Creek, Pacheco Creek near Dunneville, and Pescadero Creek near Chittenden. The locations of the gauges are shown in **Figure G-7**, and the period of record for each gauge at least partially overlaps the calibration period. Hydrographs of measured daily flows and simulated daily and monthly flows are shown in **Figure G-9**. A comparison of daily flows shows that the number and timing of simulated flow events generally correspond with measured events. The peak flows for individual events do not match well for many individual events, but simulated peaks do not consistently over- or underestimate measured peaks. Some of the differences are probably due to differences in rainfall intensity between the watershed and the rain gauge location during individual storms. The model under-simulates the duration of base flow recession in most cases. This is partly necessary to decrease annual simulated discharge—a key parameter for groundwater recharge opportunity—to match measured annual discharge. The Pacheco Creek near Dunneville gauge and the Tres Pinos Creek near Tres Pinos gauge are in the interior of the Basin, where flows are affected by gains and losses along the valley floor reach upstream of the gauge. The gains and losses are simulated by the groundwater model but not the rainfall-runoff-recharge model. Simulated monthly flows from the groundwater model are also shown on the hydrographs for those two locations. For the Pacheco Creek gauge, simulated monthly flows correspond reasonably well to the measured and simulated daily flows, after allowing for monthly averaging. The model under-simulates low flows at the

Tres Pinos Creek gauge, probably by shunting slightly too much water into the groundwater system, which also flows toward the main Basin area.

8. STREAM-AQUIFER INTERACTION

The groundwater model dynamically simulates groundwater recharge from stream percolation and groundwater discharge into streams. Percolation from streams is a function of stream flow and—where the water table is equal to or higher than the stream bed elevation—the difference in water level between the creek and water table. The MODFLOW stream flow routing (SFR) module is used to simulate these processes. Each stream in the basin is simulated as a sequence of reaches, each of which is a model grid cell along the alignment of the channel. Flow is specified at the upstream end of each stream segment and routed down the reaches, with flow to or from the aquifer calculated on the basis of wetted channel area, channel bed hydraulic conductivity and the difference in elevation between the stream surface and the simulated groundwater level in model layer 1 at that reach. By this means conservation of mass is applied concurrently to the stream and the aquifer. Streams can dry up completely as they cross the basin; and conversely, groundwater discharge can create stream flow in a segment that is dry farther upstream. The stream flow routing module allows for a network of channel segments, with multiple inflows or diversions at the start of each segment.

The San Benito model includes a network of 52 stream segments containing a total of 1,133 stream reaches (**Figure G-3**). The simulated waterways are Pacheco Creek, Arroyo de las Viboras, Arroyo Dos Picachos, Santa Ana Creek, an unnamed channel along Highway 25 southeast of Hollister, Tres Pinos Creek, the San Benito River, San Juan Creek, Miller Canal and the Pajaro River. There are three sources of surface inflow to the stream network: surface flow where the creek first enters the groundwater model domain, releases of imported CVP water for percolation (groundwater recharge), and simulated runoff from within the model domain simulated by the surface hydrology model. In addition, a number of stream segments gain flow from groundwater. For each creek that enters the groundwater basin, monthly surface inflow for the groundwater model was set equal to the sum of surface runoff and base flow simulated by the rainfall-runoff-recharge model, subtotaled for each monthly stress period. Historical monthly releases of CVP water into creeks for percolation during the dry season were obtained from District records and added to the stream segments at the corresponding locations and dates. Finally, simulated runoff from valley floor areas was also subtotaled to monthly values and added as inflow to the nearest stream segment.

Two of the variables used to calculate flow between the stream and aquifer—stream width and stage—are functions of stream flow. Based on field measurements of flow by the USGS at gauge locations and by the District at a number of small stream sites, functions relating depth and width to flow for small, medium and large channels were entered into the MODFLOW stream flow routing package as lookup tables.

9. GROUNDWATER INFLOW

Groundwater inflow into the basin from adjacent uplands—also called mountain front recharge—is very difficult to estimate. If the basin is bounded by igneous or metamorphic rocks with very limited groundwater flow through fractures, it can be reasonable to assume that inflow from bedrock is negligibly small. In the case of the North San Benito Basin, however, sedimentary rocks adjacent to the basin might have some primary porosity. Tributary watersheds in these upland areas were included in

the rainfall-runoff-recharge model in order to enforce conservation of mass in the watersheds and and produce reasonable groundwater flow rates from the watersheds into the basin. The resulting estimates are still highly uncertain, however, because groundwater outflow from the watersheds—and surface outflow, too, for that matter—are both small compared to the two largest flows in the watershed water balances: rainfall and evapotranspiration. Thus, a small error in the estimate of either of those flows can result in a large error in groundwater outflow.

Ultimately, groundwater flows produced by the rainfall-runoff-recharge model were calibrated based on their effect on simulated groundwater levels at nearby wells within the basin. In almost all cases, the initial groundwater inflow estimates were too high. The estimates were lowered primarily by increasing the estimated root depth of natural vegetation in the watersheds, which is highly uncertain due to the effects of shallow bedrock on rooting depth.

Groundwater inflow from tributary watersheds was smoothed over time to reflect attenuation of recharge pulses that occur during wet months and wet years as they gradually flow through long, relatively slow flow pathways. Smoothing was accomplished by a moving average of simulated groundwater recharge in the tributary areas over the preceding 2-10 years. This range represents local variability that was indicated by rates of recession in stream base flow and groundwater levels near the basin boundary during prolonged droughts.

The final estimate of average annual groundwater inflow during the calibration period was 5,400-7,200 AFY under normal climatic conditions. Bedrock inflow was represented in the groundwater model as a number of “injection wells” along the margin of the basin. The inflow from each tributary watershed was divided among several model cells along the boundary between the model and watershed. These are indicated by red cells along the margin of the active model flow region in **Figure G-3**.

10. ARTIFICIAL RECHARGE

Four programs have been implemented over the years to augment natural recharge of the groundwater basin. One is percolation of water released from Hernandez Reservoir (45 miles southeast of Hollister) along the channels of Tres Pinos Creek and the San Benito River. In the early years of operation, the target reaches for percolation were the reach of Tres Pinos Creek between the town of Tres Pinos and the San Benito River and the reach of the San Benito River from approximately the model boundary downstream to near Bixby Road in the San Juan Valley. Following the widespread recovery of groundwater levels in the 1990s, both of those target reaches were shortened. The second program consisted of releasing imported CVP water into local stream channels during the dry season. This was done at 13 locations in the early 1990s, but the number of locations and the amounts released were also substantially curtailed by the late 1990s. Percolation releases commenced in 1987, peaked at 10,000-11,000 AFY in 1996-1997 and were ramped down to zero by 2009. Discharge of CVP water to local creek channels is no longer permitted because of the risk of introducing non-native zebra mussels. Both of these recharge programs were included in the groundwater model by adding the historical percolation releases to the natural flows in the affected streams and allowing the MODFLOW stream package to calculate the amount and location of percolation downstream of the discharge points.

The third recharge program also involves percolation of CVP water, but in off-channel ponds instead in creek channels. That program commenced in 2017 and and achieved 2,500-5,000 AFY of recharge since then. The fourth recharge program is percolation of municipal wastewater at six locations. The Hollister

Industrial Wastewater Treatment Plant ponds and the eastern and western sets of ponds for the Hollister Domestic Wastewater Treatment Plant are located next to the San Benito River near San Juan Road. Sunnyslope County Water District operates two smaller sets of wastewater percolation ponds in the Ridgemark development at the southeast edge of Hollister. Finally, wastewater from the town of Tres Pinos is percolated at a pond adjacent to the San Benito River. All of these locations are shown as red model cells in **Figure G-3**. Annual percolation at the facilities has evolved in response to increasing population and decreasing per-capita indoor water use. Annual percolation increased from about 1,400 AFY to over 4,400 AFY during 1975-2001, then fluctuated in the 2,0000-4,000 AFY range through 2017. Wastewater from San Juan Bautista is discharged to a small creek channel that has little interaction with the groundwater basin because it is on the southwest side of the San Andreas Fault along most of its length. It is not included in the model.

11. GROUNDWATER PUMPING

Groundwater pumping from agricultural, municipal and rural domestic wells is included in the model at locations defined by geographic coordinates rather than by model grid row and column. This simplifies modification of the grid, if needed. Agriculture has historically accounted for 60-90 percent of water use as tabulated by the District. The District estimates agricultural pumping by means of hour meters installed on large irrigation wells. The discharge rate of the well is periodically measured, and the duration of pumping is multiplied by the discharge rate to obtain the volume of water pumped. An alternative estimate of total irrigation water use can be obtained by simulating crop water demand based on ETo, crop coefficient and irrigation efficiency, as is done in the surface hydrology model. Groundwater use is then estimated as total irrigation demand minus the amount of imported water or recycled water used for irrigation, which are metered. Past comparisons of the two estimates have consistently found that the hour meter estimate is much smaller than the crop water demand estimate. For consistency with the estimate of groundwater recharge, the crop water demand estimate from the surface hydrology model is used in the groundwater model.

Agricultural pumping averaged about 26,000 AFY during 1988-1992 (the first 5 years of the District's hour-meter program) and gradually declined to about 16,000 AFY in recent normal and wet years. Pumping increases when imported water supplies are curtailed. In 2009, 2013 and 2014, for example, agricultural groundwater pumping was 21,000-25,000 AFY, according to District hour-meter estimates.

The location of agricultural pumping is assigned to the center of each recharge zone. This was found to produce better calibration results than attempts to link zonal irrigation demand to physical well locations. One exception to this method was in the southeastern part of the San Juan Valley, where irrigation is supplied by off-site wells near the San Benito River. In the model, all recharge zones south of Highway 156 and east of Bixby Road were assumed to be supplied by wells along the San Benito River between Mitchell and Flint Roads.

The distribution of pumping among model layers was assumed to be the same for all irrigation wells. In order to obtain high rates of output, irrigation wells are typically relatively deep and have long screened intervals. Irrigation pumping was divided between model layers 3 and 4 (60 and 40 percent, respectively). This reduced problems with model cells going dry when pumping was assigned to layers 1 and 2, which are much thinner. Vertical gradients within the interval of maximum pumping (about 150-600 feet below ground surface) are unknown but probably small, given that the boreholes themselves allow equalization of water levels when the pumps are off. Also, the zonal pattern of aquifer

characteristics is the same for model layers 3, 4 and 5 (with a few local exceptions), which means that differences in estimated hydraulic conductivity between layers would not be a likely cause of vertical variations in groundwater extraction. The calibrated model produced water levels for layers 3, 4 and 5 that were typically within a few tenths of a foot of each other. Larger gradients—mostly downward, but upward in recent years at two locations—were present between layers 1 and 3.

Groundwater pumping at municipal supply wells is metered and recorded by the water purveyors. The City of Hollister, Sunnyslope County Water District and the City of San Juan Bautista were supplied by six, eight and three wells during the calibration period, respectively. Municipal pumping totaled 5,000-7,500 AFY during 1988-2002. When the Lessalt Water Treatment plant was completed in 2003, some use shifted to imported water and municipal pumping dropped to around 5,000 AFY. Further decreases occurred due to conservation during the 2013-2015 drought and completion of the West Hills Water Treatment Plant in 2017. Municipal groundwater pumping has been less than about 3,000 AFY since then. Municipal pumping during 1975-1987 was projected backward from more recent data based on population trends. Metered pumping was assigned to the actual well locations with the same depth distribution as irrigation pumping. There are 50 commercial and industrial supply wells that pumped more than 20 AFY (according to the District's estimate), and their production was included individually in the model according to their respective locations and volumes reported to the District.

Domestic pumping at rural residences amounts to 2-3 percent of total basin-wide groundwater production. Rather than include hundreds of domestic wells in the model individually, total rural domestic pumping was divided among 130 hypothetical well locations that were scattered throughout areas where there are large numbers of rural residences. The District's estimates of rural domestic pumping during 2006-2008 (which averaged 490 AFY) was extrapolated backward and forward in time based on countywide population trends. Rural domestic pumping was assigned to model layers 2 and 3, reflecting the relatively shallow depth of typical domestic wells.

11.1. Evapotranspiration by Riparian Vegetation

In locations where the water table is shallow, some plants (phreatophytes) can extract water directly from the water table to meet evaporative demand. In northern San Benito County, this occurs along some stream reaches where riparian vegetation includes phreatophytes such as willow, cottonwood and sycamore trees. Phreatophytic vegetation uses rainfall in preference to groundwater, and the consumptive use of groundwater was roughly estimated as annual ETo (48 inches) minus annual rainfall (14 inches), or 34 inches per year. This same differencing approach was applied monthly throughout 1975-2017 to create a complete time series of one-dimensional riparian ET demand.

Evapotranspiration of groundwater by phreatophytes was not included in the 2014 version of the groundwater model. However, effects of pumping on groundwater dependent ecosystems—including riparian vegetation—must be addressed in groundwater sustainability plans. Accordingly, the MODFLOW evapotranspiration (EVT) module was added to the 2019 version of the model. For each stream cell in the model, the total canopy width of the riparian vegetation corridor was estimated from inspection of recent aerial photographs (Google Earth). Utilization of groundwater by phreatophytes was assumed to decrease linearly with water table depth, reaching zero when the water table is more than 15 feet below the stream bed elevation.

11.2. Drains

The model successfully simulated upward head gradients in areas where flowing wells have historically been observed: along the lower end of Pacheco Creek and in the San Juan Valley west of San Juan Bautista. By definition, the groundwater elevation at a flowing well is higher than the ground surface. In reality, the water that flows out of wells or discharges from seeps does not pond to any significant depth, but rather flows via ditches to a nearby creek channel. In the San Juan Valley, agricultural tile drains are common in the shallow groundwater area, and most of the drain sumps discharge to San Juan Creek. Drains are less common along lower Pacheco Creek. In that area, the MODFLOW drain package was used to represent surface runoff of discharging groundwater and thereby prevent simulated water levels from rising above the ground surface, which could alter the amount of groundwater discharge simulated by the model. The area with drain cells is shown in **Figure G-3**.

12. MODEL CALIBRATION

Model calibration is a process in which inputs to the model and parameters within the model are adjusted until the model is able to simulate historically observed groundwater levels and flows with a reasonable level of accuracy. The calibration period for the San Benito model was water years 1975-2017 (water years in this case begin October 1 of the preceding calendar year and end September 30). The District has systematically monitored groundwater elevations since 1976. A total of 8,480 measured water levels at 84 well locations were used for calibrating the model and statistically evaluating its accuracy. Stream flow at three gauge locations within the basin—the San Benito River at San Juan Road, Tres Pinos Creek near Tres Pinos and Pacheco Creek at Walnut Avenue—was also compared with stream flows simulated by the model.

12.1. Method

Joint calibration of the surface hydrology model and groundwater flow model was achieved by trial-and-error adjustments of selected variables, as informed by the timing and location of model residuals. The residual for each water-level measurement equals the observed water level minus the simulated water level at that location and date. All inputs to a model are estimates that are subject to errors or uncertainty, but some are better known than others. Also, some have relatively pronounced effects on simulation results. For example, the amount of water pumped by municipal wells is metered and is considered highly accurate compared to most model inputs. Accordingly, the amount of municipal pumping was not adjusted during calibration. Conversely, the rate of leakage from the shallow groundwater zone to the principal water supply aquifer is highly speculative, and plausible values cover a wide range. Variables were selected for adjustment during calibration based on their relative uncertainty, the sensitivity of results to that variable, and whether the variable might logically be connected to an observed pattern of residuals based on hydrologic processes. In practice, most of the calibration effort focused on adjustments to horizontal and vertical hydraulic conductivity, the locations and conductances of faults, stream bed vertical hydraulic conductivity, and several tributary watershed parameters: root depths of natural vegetation, rainfall-runoff thresholds and slopes, and the leakage and recession rates for shallow groundwater. Variables that were not adjusted during calibration include land use, crop root depths, pumping locations, and groundwater pumping (agricultural, municipal, commercial-industrial or rural domestic).

The measured water levels that served as the basis for calibration are themselves subject to substantial uncertainty stemming from wellhead elevation errors, effects of recent pumping at the measured well, and wells that for unknown reasons have water levels inconsistent with water levels at nearby wells. Wellhead elevations were estimated by District staff from U.S. Geological Survey topographic maps with a contour interval of 10 feet. Almost all of the wells used to monitor water levels are active water supply wells. If a well was pumping shortly before the water level is measured, the water level will be much lower (by feet to tens of feet) than if the well had been idle for a day or more. In some hydrographs, pumping-affected water levels stand out as obvious anomalies. A number of those points were removed from the calibration data set. In other cases, water levels fluctuate over a wide range seasonally and between measurements, and pumping effects could not be systematically identified and eliminated. This was particularly true for wells in the Bolsa area, where the degree of aquifer confinement is high and the magnitude of short-term water-level fluctuations is consequently greater. In two wells (12S/5E-22N1 and 13S/5E-3H1) the measured hydrographs exhibited large intermediate-term fluctuations completely unlike the water-level patterns at nearby wells. These appeared to be situations where pumping at the well was discontinued for several years, then later resumed. These wells were omitted from the statistical evaluation of calibration accuracy.

Model performance during the calibration process was evaluated primarily by visual inspection of superimposed measured and simulated water-level hydrographs. Adjustments to model inputs and parameters were made only if two or more wells in a given area exhibited similar patterns of discrepancies between measured and simulated water levels. In accordance with the principle of parsimony in modeling, calibration began with a small number of broad zones for hydraulic conductivity and storativity. Zones were subdivided during calibration if a pattern of residuals at multiple wells warranted it. Although storativity and hydraulic conductivity are not necessarily correlated, in practice they often are to some degree. Thus, for simplicity, the same zonation pattern was used for both variables.

The process of manually calibrating a groundwater model produces considerable insight into the groundwater flow system and the factors that influence it. Water levels for some wells were easy to reproduce with the model, while others were more difficult.

12.2. RESULTS

12.2.1. Aquifer Characteristics

The groundwater model represents the basin fill materials in terms of their ability to store and transmit groundwater. Horizontal and vertical hydraulic conductivity define the permeability of the aquifer, which is its ability to transmit groundwater flow. The ability to store water consists of two components. At the water table, storage of water associated with filling or draining the empty (air-filled) interstices between mineral grains is represented by the specific yield of the aquifer. In deep aquifers, there is a much smaller ability to store and release groundwater that derives from the compressibility of the water and aquifer materials (specific storativity). Thus, the initial response to pumping from a deep aquifer is a large drop in water level (head) within that aquifer. With sufficient time, however, the decrease in head creates downward movement of groundwater that eventually accesses the storage capacity at the water table. In other words, the storage response of the aquifer depends partly on the duration of pumping and observation. For groundwater management purposes, storage responses over periods of months to decades are usually the most relevant.

Aquifer characteristics can be estimated in two ways. The first is by means of an aquifer test in which one well is pumped while water levels are measured at a nearby well. This approach typically measures horizontal hydraulic conductivity over distances of tens to hundreds of feet and storage responses over periods of 1-3 days. The second approach is to calibrate a groundwater flow model such that the aquifer characteristics reproduce measured historical water levels throughout the basin given estimates of historical recharge and pumping. The latter approach produces estimates of aquifer characteristics averaged over spatial scales of thousands to tens of thousands of feet and time scales of months to decades. The estimates account for preferential flow through localized sand and gravel lenses in the basin fill materials and for delayed water-table responses to deep pumping. Also, model calibration provides estimates of vertical hydraulic conductivity across the layers of alluvial deposits, which is rarely measured by aquifer tests. The temporal and spatial scales represented by the model calibration approach are better for addressing most long-term groundwater management questions. Calibration of hydraulic conductivity and specific yield values for the San Benito model were guided by the range of reasonable values for various sediment textures indicated by aquifer tests and calibrated groundwater models in other areas.

Figure G-10 shows the distribution of aquifer characteristics derived from model calibration in model layer 1 (upper left), model layer 2 (upper right) and model layers 3, 4, and 5, which have the same characteristics. The distribution consists of a mosaic of zones of uniform characteristics. A total of 24 zones were delineated, with horizontal and hydraulic conductivities ranging from 0.2 to 120 feet per day (ft/d), vertical hydraulic conductivities from 0.005 to 5 ft/d, specific storativity ranging from 0.000005 to 0.0002 per foot, and specific yield ranging from 0.02 to 0.18.

Horizontal hydraulic conductivity naturally ranges over several orders of magnitude: from 0.01 to 1,000 ft/d for the range of silt, sand and gravel textures found in the basin aquifers (Fetter, 1994). Therefore, the range in the model is reasonable. It should be noted that in flow systems where hydraulic conductivity varies by more than an order of magnitude, almost all of the groundwater movement will be through the relatively permeable zones.

The distribution of horizontal hydraulic conductivity is also reasonably consistent with expected depositional patterns. Coarse, permeable deposits are expected to be relatively abundant where large creeks and the San Benito River enter the basin, and along their present channel alignments in model layer 1. Sediment grain size and permeability are expected to decrease toward the center of the basin due to lower stream gradients and velocities. Also, relatively continuous silt-clay layers must be present at lower elevations in the basin to produce the flowing artesian wells that were widespread prior to 1920 (Clark, 1924) and reappeared in similar locations following groundwater recovery in the 1990s. Hydraulic conductivity in hilly upland areas is also relatively low, partly due to the finer average grain size and greater degree of consolidation of those geologic formations and partly due to folding and local faulting that act to impede horizontal groundwater flow.

The hydraulic conductivity values across faults included in the model are shown in **Figure G-11**. The values assume a fault plane thickness of 1 foot and were obtained entirely by calibration to match the observed difference in water levels across the fault. Faults can obstruct groundwater flow by offsetting permeable layers within the basin fill and by creating a shear zone of crushed material (fault gouge) that has relatively low permeability.

12.2.2. Water Levels

Hydrographs comparing simulated with measured water levels during water years 1975-2017 were prepared for the 84 well locations shown in **Figure G-12**. The hydrographs are shown in **Figure G-13 a through f** according to township/range location or generally west to east. At most wells, the model reproduces the water level history reasonably well, including the long-term recovery from overdraft, water-level declines during the 1987-1992 drought, subsequent rapid recovery during the 1990s, the leveling off of water levels at wells that recovered to the elevation of a nearby stream, and another cycle of decline during the 2013-2015 drought.

The difference between each measured water level and the corresponding simulated water level is the residual. Residuals can be summarized statistically to obtain an objective measure of model performance. The model calibration guidelines presented in ASTM D-5490-93 recommends that these statistical summaries be calculated. The residuals statistics are not a completely objective measure of model performance because some water-level measurements were omitted or assigned a low weight based on a subjective conclusion that they were not representative of ambient groundwater conditions (such as a measurement made while the well pump was operating). Measurements that clearly appeared to be affected by pumping (much lower than prior and subsequent measurements at that well) were omitted from the calibration set in this case, but most were retained even if they seemed "noisy".

Deciding whether model performance is "good enough" based on residuals statistics is also subjective. A common rule of thumb is to consider model performance acceptable if the root-mean-squared residual is less than 10 percent of the total range of measured water levels (Environmental Simulations, Inc., 2011). In the present case, the total elevation range of the 8,480 water-level observations was 780 feet. The mean residual was -8.68 feet, which indicates a slight bias toward simulated water levels that are higher than measured water levels. Most of this bias is in the Bolsa area, where simulated water levels are generally near the upper part of the broad spread of measured water levels (many of which are probably low due to recent or nearby pumping). In other cases, large discrepancies were associated with localized patterns that calibration adjustments were simply unable to reproduce. For example, measured water levels in several wells in the area around McCloskey, Fallon and Fairview Roads (wells 12S/5E-36B20, -24N1, and to a lesser degree -14N1 and -23A20) stayed flat or declined during 1976-1984 then rose during 1985-1992, which was opposite of the simulated trends and the observed trends at most wells. No combination of model parameters and inputs was able to reproduce this local pattern.

The root-mean-squared error (RMSE) was 3.5 percent of the range of water levels. **Figure G-14** shows a scatterplot of simulated versus observed water levels. Although there is some spread to the data cluster, it is fairly centered on the 1:1 line throughout the range of water levels. The RMSE is most sensitive to the largest discrepancies between measured and simulated water levels. Simulated water levels are mostly higher than measured water levels in the Bolsa area at the low end of the elevation range. This is because most of the measured water levels are probably affected by pumping. At the high end of the elevation range, the model had difficulty simulating a water level profile along Paicines Valley as flat as the measured profile, so many simulated water levels at the upstream end of the valley are consistently higher than the measured water levels.

Contours of simulated groundwater levels are shown in **Figure G-15** for October 1992 and in **Figure G-16** for March 2012. Measured water levels on those dates are posted as points. The fall 1992 contours represent a condition of drought-related low water levels prior to the importation of significant quantities of water. The spring 2012 water levels represent the basin in a near fully-recovered state

under normal climatic conditions. Faults cause conspicuous stair-steps in the water-level surface in both maps. On the earlier date, water levels in the Hollister Subbasin east of the Calaveras Fault had yet to recover from overdraft during prior decades. A broad pumping trough in that area was centered around the airport. By 2012, water levels in that area had mostly recovered, and a northwesterly gradient prevailed throughout that area.

12.2.3. Stream Flow

Simulated stream flow was compared with measured stream flow at three locations within the basin where stream gauges were operating during all or part of the calibration period. To be consistent with model output, measured daily flows were averaged to monthly values. **Figure G-17** shows flows in Pacheco Creek at Walnut Avenue, Tres Pinos Creek near Tres Pinos and the San Benito River at San Juan Road. At the Pacheco Creek gauge, the simulated pattern of high and low flows generally matched the measured pattern, although the model tended to slightly more small flow events. At the Tres Pinos Creek gauge, simulated stream flows were generally smaller and less frequent than measured flows. The model probably slightly overestimates subsurface flow at that location. At the San Benito River gauge near San Juan Road, the model consistently produces too much base flow, on the order of 10-20 cfs. This is the opposite of the Tres Pinos Creek bias and likely is associated with an underestimate of subsurface flow along the river corridor at that location. Relatively small changes in aquifer hydraulic conductivity can noticeably change the amount of flow shunted from groundwater to surface water or vice versa.

12.2.4. Water Balance

The ZoneBudget post-processing program was used to extract annual water balances from the model for the four management areas in the basin. **Figures G-18 through G-21** show annual inflows and outflows during 1975-2017 as stacked bars for each of the four management areas. Annual storage change is not included in the stacked bars; rather, cumulative storage change is shown as a line.

In the Southern MA, inflows were dominated by large amounts of stream percolation and rainfall recharge in exceptionally wet years. That recharge raised groundwater levels, which concurrently increased groundwater discharge back to the streams along gaining reaches. The apparent long-term increase in storage is mostly an artifact of selecting initial water levels in upland areas (where no data are available) that were too low, and partly the result of average annual rainfall during 1975-2017 that was slightly higher than the longer-term average.

In the Hollister MA, rainfall and stream recharge are also large during wet years, but other inflows—including irrigation deep percolation, bedrock inflows and inflows from other management areas—is relatively steady. Outflows are dominated by agricultural groundwater pumping, followed by relatively steady outflows to other management areas. The cumulative increase in storage during 1975-2017 was real. Importation of CVP water beginning in the early 1990s resulted in rapid recovery from prior decades of groundwater overdraft. The pattern of inflows and outflows was generally similar in the San Juan MA, which also received CVP water.

In the Bolsa MA, relatively steady subsurface inflows of groundwater from other MAs and the Llagas Subbasin comprise a substantial part of total inflows. Recharge from rainfall and streams are significant but vary greatly from year to year. Agricultural pumping is by far the largest outflow, followed by groundwater discharge to the Pajaro River when groundwater levels are relatively high. There was little long-term change in storage in the Bolsa MA.

13. SIMULATION OF FUTURE CONDITIONS

The historical period used for model calibration consisted of only 43 years (water years 1975-2017). Longer periods were needed to simulate future conditions. To comply with the Sustainable Groundwater Management Act, future simulations needed to include at least 50 years, and design work for possible expansion of Pacheco Reservoir was based on the 1922-2003 period simulated by DWR's CalSim2 model. These needs were met by simulating water years 1922-2007 as two back-to-back 43-year simulations (1922-1964 followed by 1965-2007). This period takes advantage of DWR's CalSim2 simulations of CVP availability, which cover the period 1922-2003. It also includes the two largest droughts in the historical record: 1923-1935 and 1987-1992.

The future baseline simulation serves as a reference condition against which to compare alternative management scenarios. Data and assumptions used in the future baseline simulation are described in Section 5 of the GSP ("Water Budget"). Inputs and results of the "climate change" and "future growth" scenarios are described in Section 8 ("Management Actions"). Other scenarios related to specific management actions recommended in the GSP are also described in Section 8.

14. MODEL LIMITATIONS

The groundwater flow model is an appropriate tool for evaluating groundwater conditions at the basin and subarea scale over periods of months to decades. Given its reasonable calibration under a wide range of historical hydrologic and water management conditions, it should produce reliable results under a similar range of future conditions. However, some aspects of the model and some types of applications may be less reliable. Limitations in model accuracy and in types of applications include the following:

- As with any regional model, the model cannot simulate details of water levels and flow at spatial scales smaller than one model cell. It cannot, for example, simulate drawdown within a pumping well. It can only simulate the average effect of that pumping on the average water level of the cell in which the well is located.
- The monthly stress periods of the model preclude simulation of brief hydrologic stresses. For example, the model cannot simulate the effects of daily pumping cycles on water levels, or the amount of recharge associated with peak stream flow events.
- The vertical dimension of the model is relatively crudely implemented, and its accuracy is unknown due to lack of depth-specific water-level data. With a few local exceptions, model layers do not correspond to known geologic horizons. The distribution of pumping among layers is by fixed percentages that bear some relation to layer thickness but not transmissivity. Given the lack of depth-specific water-level data within the main production interval (roughly 150-600 feet below ground surface) it was not possible to calibrate vertical hydraulic conductivity in most areas. An exception was the constraint on vertical hydraulic conductivity imposed by the occurrence of flowing wells in two areas.
- Surface and subsurface inflows from tributary watersheds around the perimeter of the basin remain uncertain. The new rainfall-runoff-recharge model simulates watershed hydrology explicitly but flows from the watersheds to the groundwater basin are small compared to rainfall and ET. Accurate data for those variables within the watershed areas are not available, and a small error in rainfall or ET can result in a large error in simulated watershed outflow.

- Model calibration is better in some parts of the basin than others. For any future model application that focuses on a particular subarea, it would be prudent to evaluate the quality of model calibration for that area before conducting simulations of alternative conditions.

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Table G-1. 2014 Land Use by Management Area (acres)

	1	2	3	4	5	
Land Use	**Bolsa**	**Hollister**	**San Juan**	**Southern**	**Watersheds**	**Total**
Subtropical	0	42	17	0	0	59
Deciduous orchard	452	4,976	797	240	125	6,590
Field crops, irrigated	953	2,316	581	330	60	4,240
Grain, nonirrigated	2,510	4,612	342	847	3,552	11,863
Idle	218	437	628	831	403	2,517
NV-riparian	161	318	460	478	112	1,530
Not surveyed	0	0	0	0	0	0
NV-grass	7,977	22,950	14,732	48,877	218,682	313,218
NV-brush	0	411	0	226	64,445	65,083
NV-brush/trees	6	63	0	0	56,665	56,734
Water	195	22	264	175	155	811
Pasture, nonirrigated	5,708	564	60	123	420	6,874
Rural residential	56	1,740	82	53	110	2,041
Semiagricultural	379	536	56	92	312	1,375
Small vegetables	951	7,378	5,756	820	4,665	19,570
Small vegetables, Bolsa	3,370	764	0	0	0	4,134
Urban commercial	0	712	62	13	73	861
Urban industrial	14	297	424	36	105	876
Urban turf	0	522	343	91	1	958
Urban residential	5	3,370	251	6	90	3,722
Urban vacant	0	367	0	0	40	408
Vineyard	0	163	0	1,743	1,252	3,158
Total	22,955	52,560	24,857	54,979	351,268	506,620

Table G-2. Monthly Crop Coefficients for Vegetation Types Simulated by the Recharge Program

Agricultural	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Subtropical[1]	0.50	0.50	0.50	0.50	0.50	0.63	0.91	0.82	0.49	0.46	0.50	0.50
Deciduous orchard[2]	0.20	0.20	0.25	0.35	0.50	1.10	1.10	1.10	1.10	0.65	0.20	0.20
Field crops, irrigated[3]	0.50	0.50	0.50	0.50	0.50	0.63	0.91	0.82	0.49	0.46	0.50	0.50
Grain, nonirrigated[4]	0.90	1.05	1.05	0.90	0.50	0.20	0.20	0.20	0.20	0.24	0.33	0.65
Idle (bare soil)[5]	0.90	0.80	0.50	0.30	0.20	0.20	0.20	0.20	0.20	0.30	0.50	0.90
Pasture, nonirrigated[6]	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Small vegetables[7]	0.50	0.50	0.50	0.60	0.80	0.95	0.95	0.95	0.85	0.60	0.50	0.50
Small vegetables - Bolsa	0.50	0.50	0.50	0.50	0.40	0.65	0.90	0.95	0.85	0.60	0.50	0.50
Vineyard[8]	0.81	1.05	1.05	0.90	0.50	0.35	0.45	0.50	0.50	0.20	0.33	0.57
Natural												
Riparian phreatophytes[9]	0.75	0.75	0.75	0.75	0.85	1.00	1.10	1.10	1.10	0.95	0.85	0.75
Grass[10]	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Brush[11]	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Trees[11]	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Water[12]	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Urban[13]												
Rural residential	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Semiagricultural	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Commercial	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Industrial	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Lawn, golf course, sod farm	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Residential	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Vacant or paved	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80

Sources and Assumptions

Note: FAO 56 = U.N. Food and Agriculture Organization Publication 56 (2006). BIS = Basic Irrigation Scheduling computer program by Snyder and others (2007). Bulletin 113-3 = DWR (1975). ITRC = Irrigation Training and Research Center (2003).

Kc = crop coefficient.

[1] FAO 56, Table 12 (single Kc by growth stage). The low-Kc season is assumed to be winter in CA.

[2] Kc for walnuts from FAO 56 Table 12 for May-Oct; bare soil (0.2) for other months plus some cover crop ET Mar-Apr.

[3] ITRC values shifted to summer season. Assume bare soil = K_{ini} from FAO 56 (typically 0.20).

[4] BIS Kc for winter grains. Assume other months are bare soil at Kc=0.20

[5] Assume similar to reference ET conditions in winter. Automatically depletes soil moisture in summer until soil is dry (nonirrigated), so summer Kc not important.

[6] Most areas mapped as pasture are not irrigated. ET in winter is close to ETo. Soil moisture depletion in summer reduces Kc.

[7] Assume these are cool season crops (e.g. lettuce, broccoli, celery) grown March-November (April-November in Bolsa) with staggered plantings. Full-canopy Kc is 0.90-1.0. Time-weighted average Kc over the entire crop growing period was calculated for 10 cool-season truck crops from FAO 56 growth-stage Kc values (Kc as % of growing season). Average was 0.78. Decreased slightly here to reflect brief idle periods between crops (bare soil at Kc=0.20).

[8] Assume 3-ft-wide canopy and 10-foot row spacings, using equations from Williams (2001). With winter cover crop of grasses simulated as nonirrigated grain.

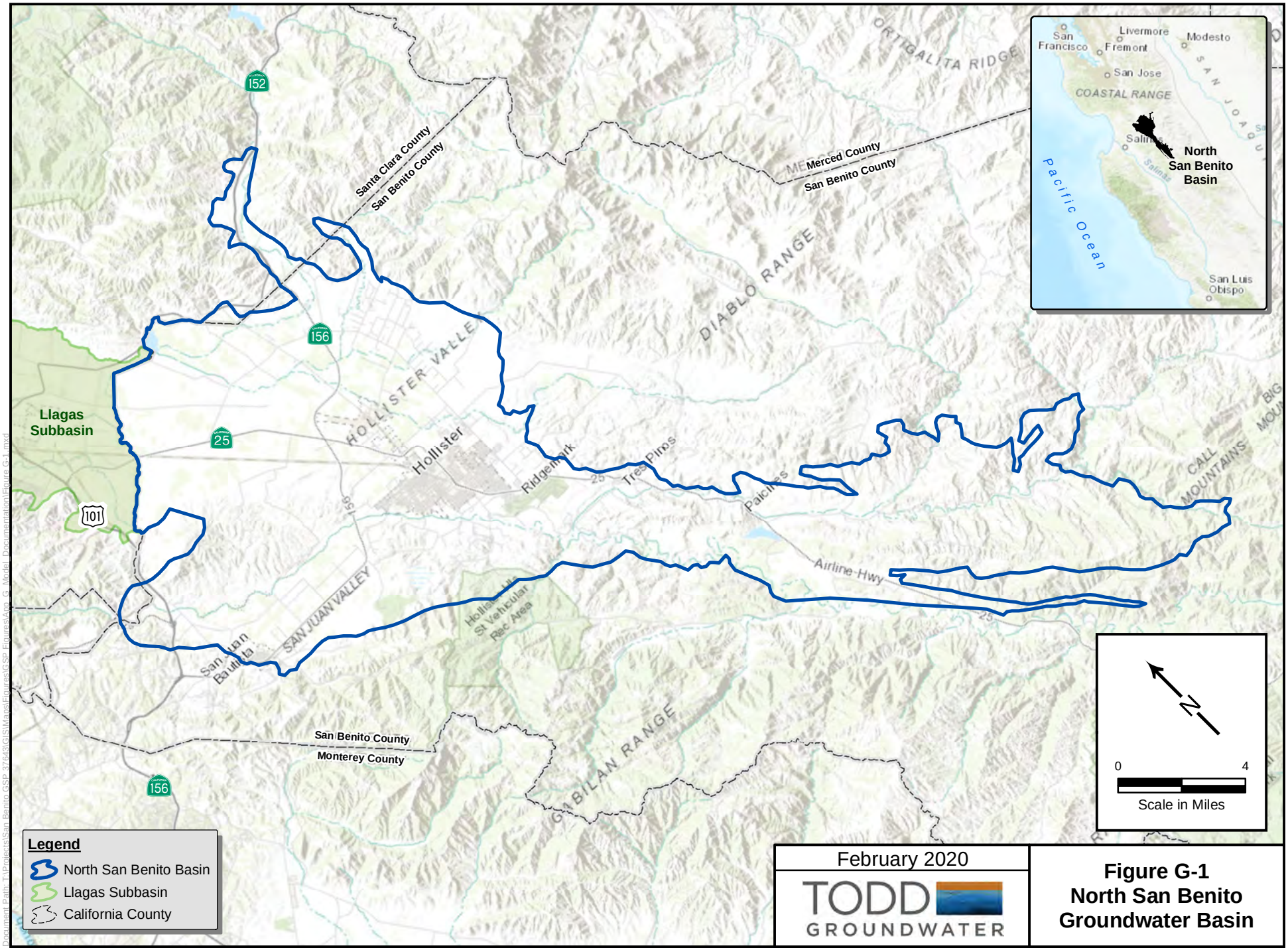
[9] Assume mostly trees (cottonwood, sycamore, willow), deciduous with shrub willow understory (willow Kc in winter). Monthly Kc values reflect total canopy leaf area and unrestricted root access to water.

[10] Similar to reference ET conditions in winter. Annual grasses deplete soil moisture in summer until soil is dry, so summer Kc not important.

[11] Kc less that 1.0 because of drought-tolerant adaptation to carry some soil moisture over to following year (Blaney and others, 1964). Soil moisture depletion in summer is not as extreme as for annual grasses.

[12] Farm ponds (e.g. for vineyard frost protection). Evaporation estimated as average ratio of pan evaporation to ETo (1.26) multiplied by a pan-to-lake coefficient of 0.9 (for a pond or small lake).

[13] Irrigation in all urban land use categories assumed to be for turf. Turf Kc from BIS.



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TODD GROUNDWATER

Figure G-1
North San Benito Groundwater Basin

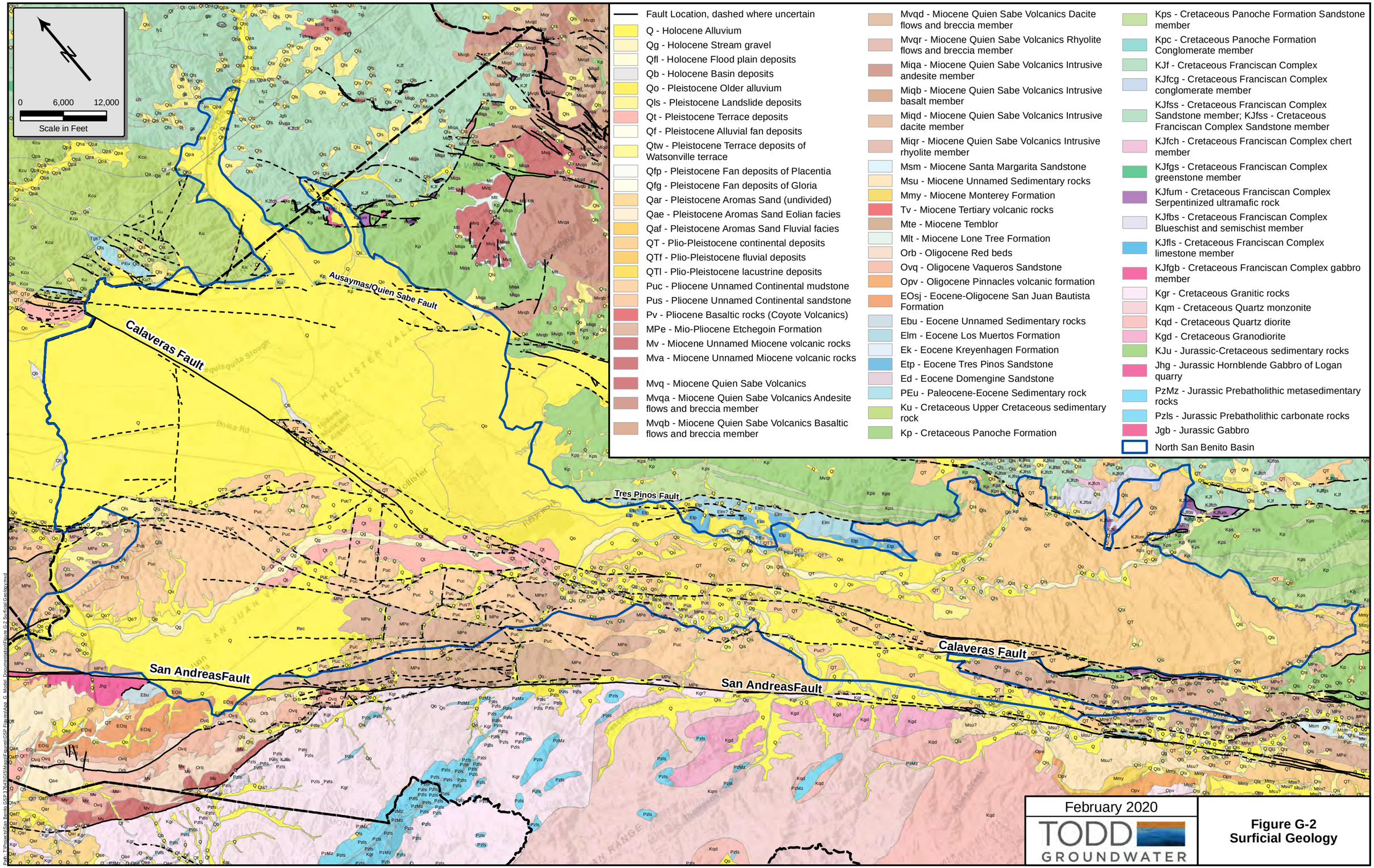

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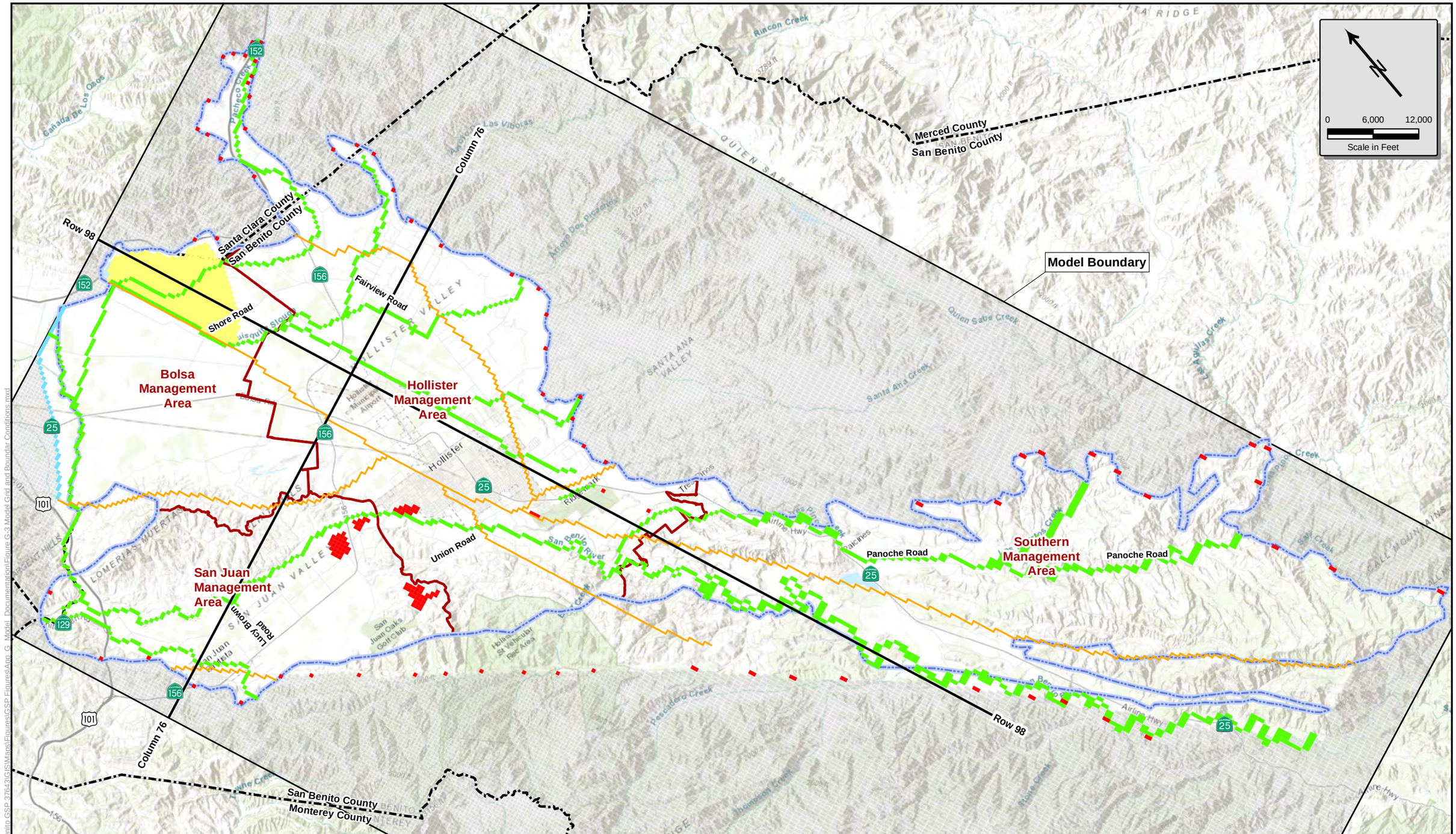
Figure G-2
Surficial Geology



Management Areas
North San Benito Basin
San Benito County
Flowing Wells Area
Subsurface Inflow from Llagas
Wastewater Ponds, San Justo and Bedrock Inflow
Stream Cells
Inactive Cells
Faults in Model
Cross Section Line

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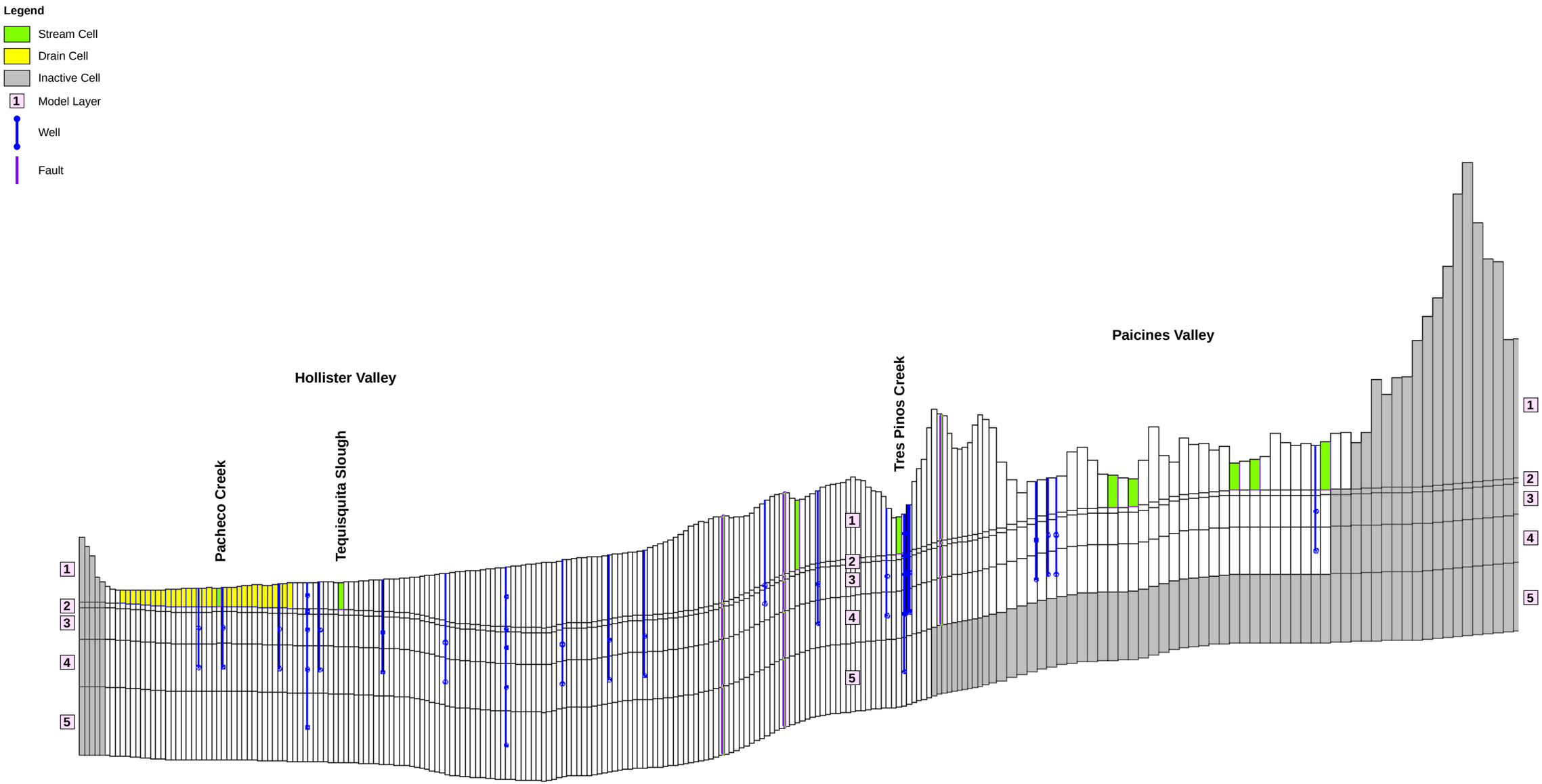
TODD GROUNDWATER

Figure G-3
Model Grid and Boundary Conditions

Path: T:\Projects\San Benito GSP 37643\GIS\Maps\Figures\GSP Figures\App G_Model Documentation\Figure G-3 Model Grid and Boundary Conditions.mxd



February 2020	Figure G-4 Cross Section of Model Grid Along Row 98
TODD GROUNDWATER	

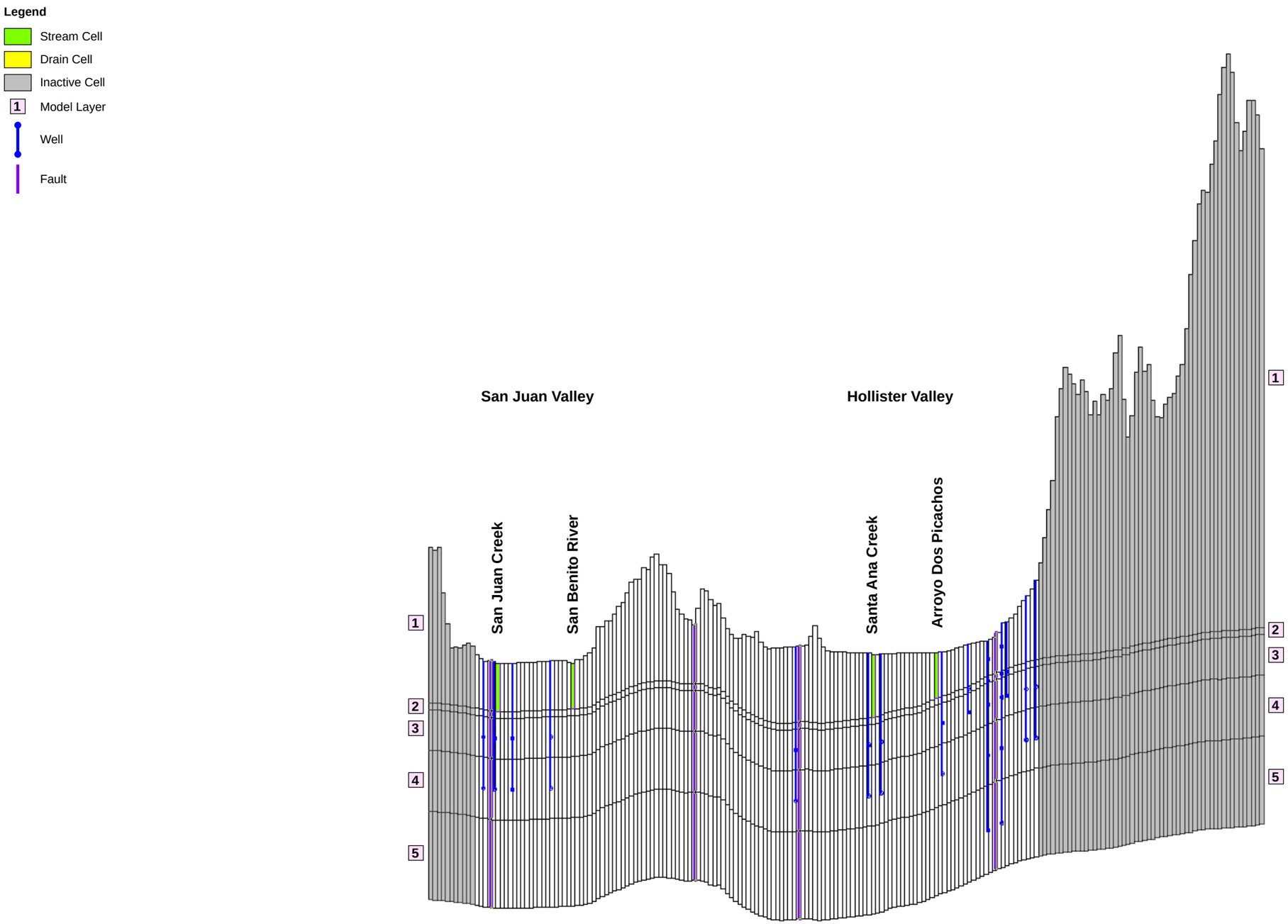


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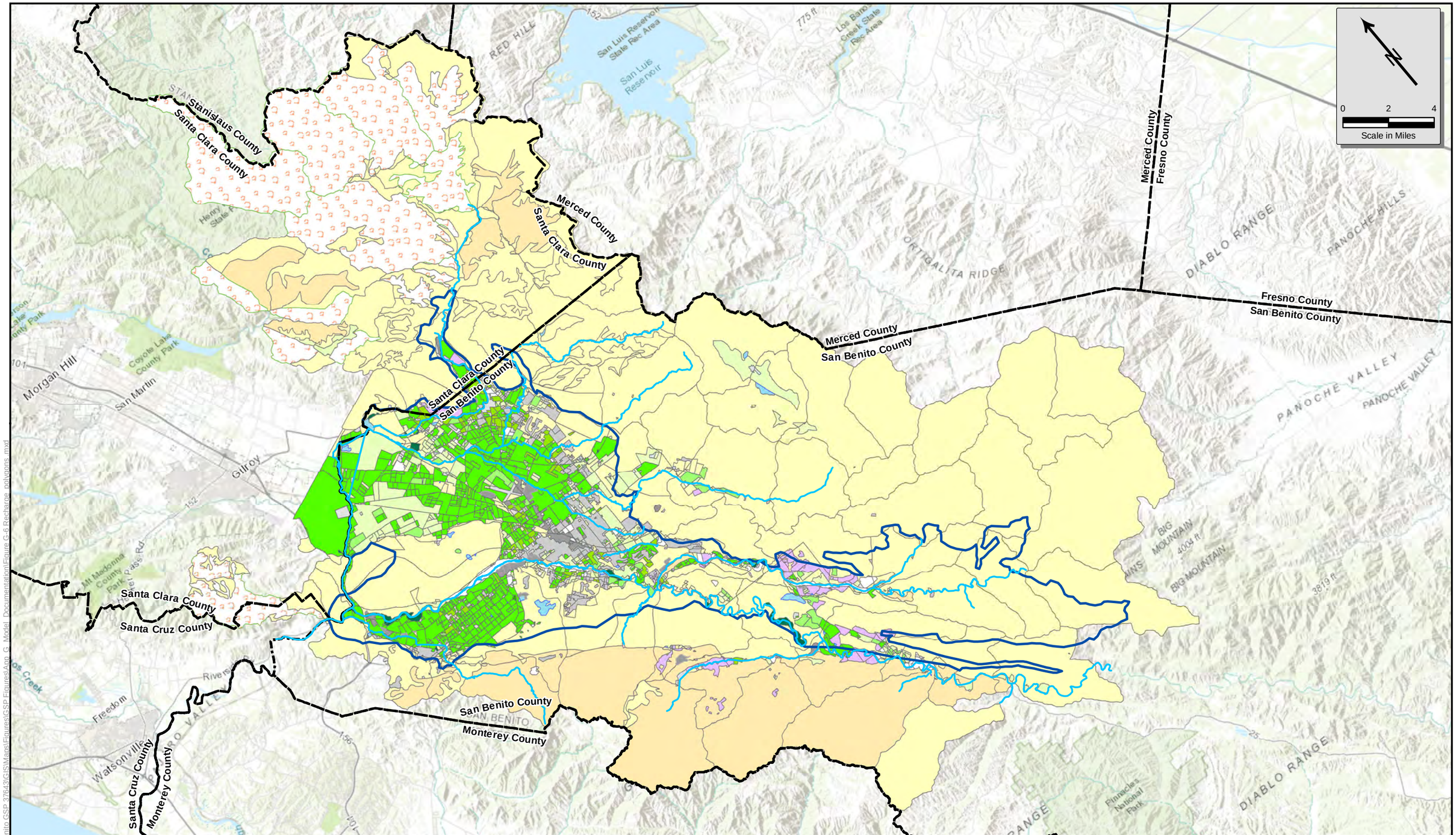
Figure G-5
Cross Section of Model Grid Along Column 76



North San Benito Basin

2014 Land Use

- Citrus
- Deciduous orchard
- Field crops, irrigated
- Grain, nonirrigated
- Idle
- NV-brush
- NV-brush/trees
- NV-grass
- NV-riparian
- Pasture, nonirrigated
- Rural residential
- Semiagricultural
- Small vegetables
- Small vegetables, Bolsa
- Urban commercial
- Urban industrial
- Urban residential
- Urban turf
- Urban vacant
- Vineyard
- Water

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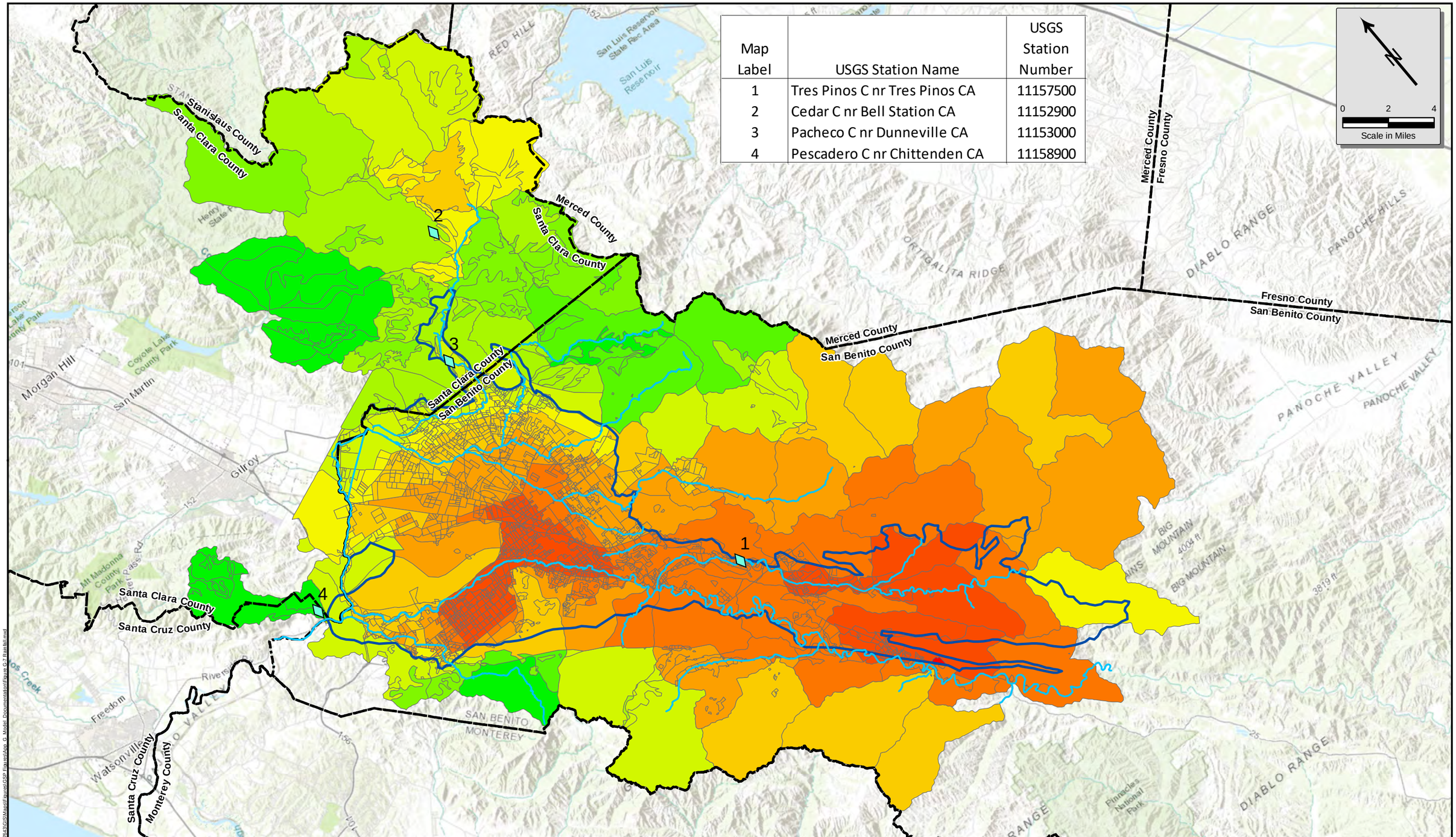
TODD GROUNDWATER

Figure G-6
Rainfall-Runoff-Recharge Polygons

Path: T:\Project\San Benito GSP 37643\GIS\Maps\Figures\GSP Figures\App G_Model_Documentation\Figure G-6 Recharge polygons.mxd



Map Label	USGS Station Name	USGS Station Number
1	Tres Pinos C nr Tres Pinos CA	11157500
2	Cedar C nr Bell Station CA	11152900
3	Pacheco C nr Dunneville CA	11153000
4	Pescadero C nr Chittenden CA	11158900

Stream Gauge

North San Benito Basin

Average Annual Precipitation (inches)

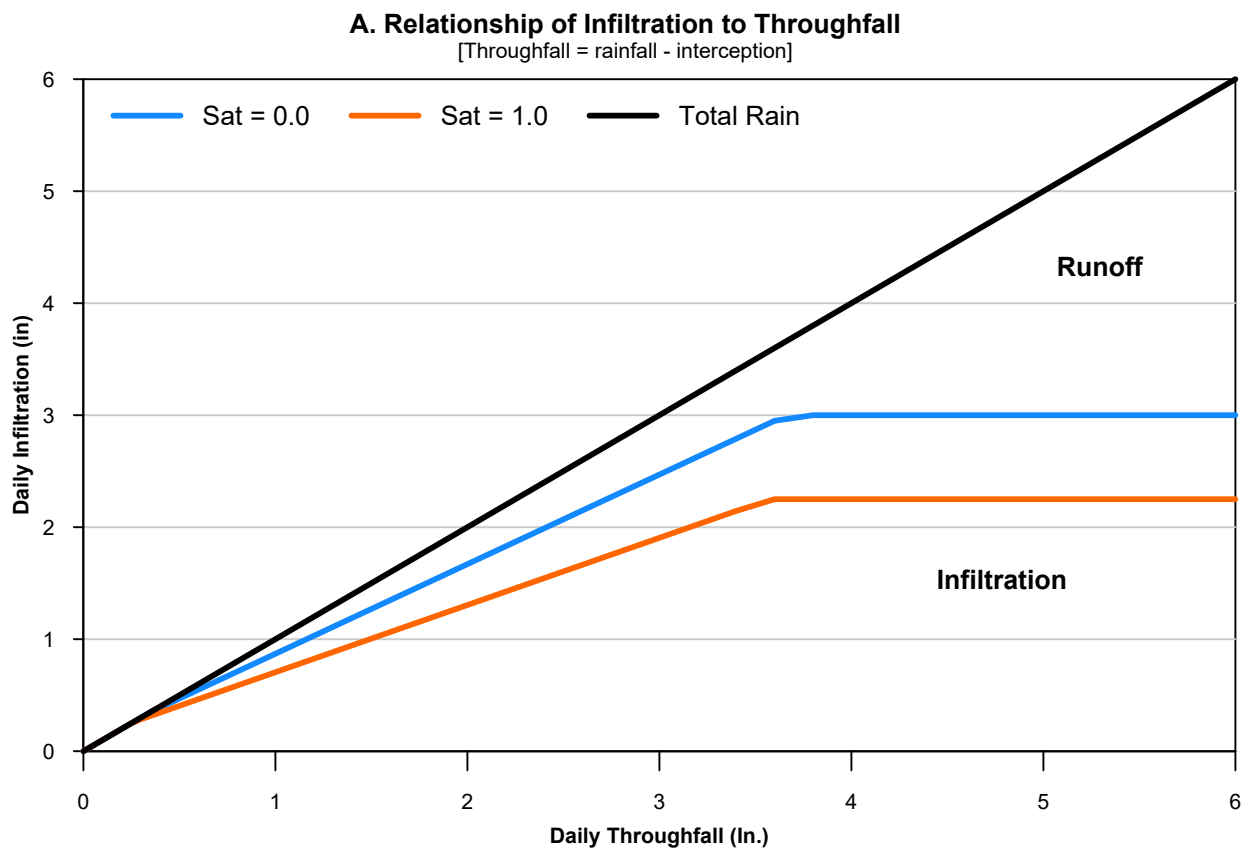
14
14 - 15
15 - 16
16 - 17
17 - 18
18 - 19
19 - 20
20 - 21
21 - 22
22 - 23
23 - 26

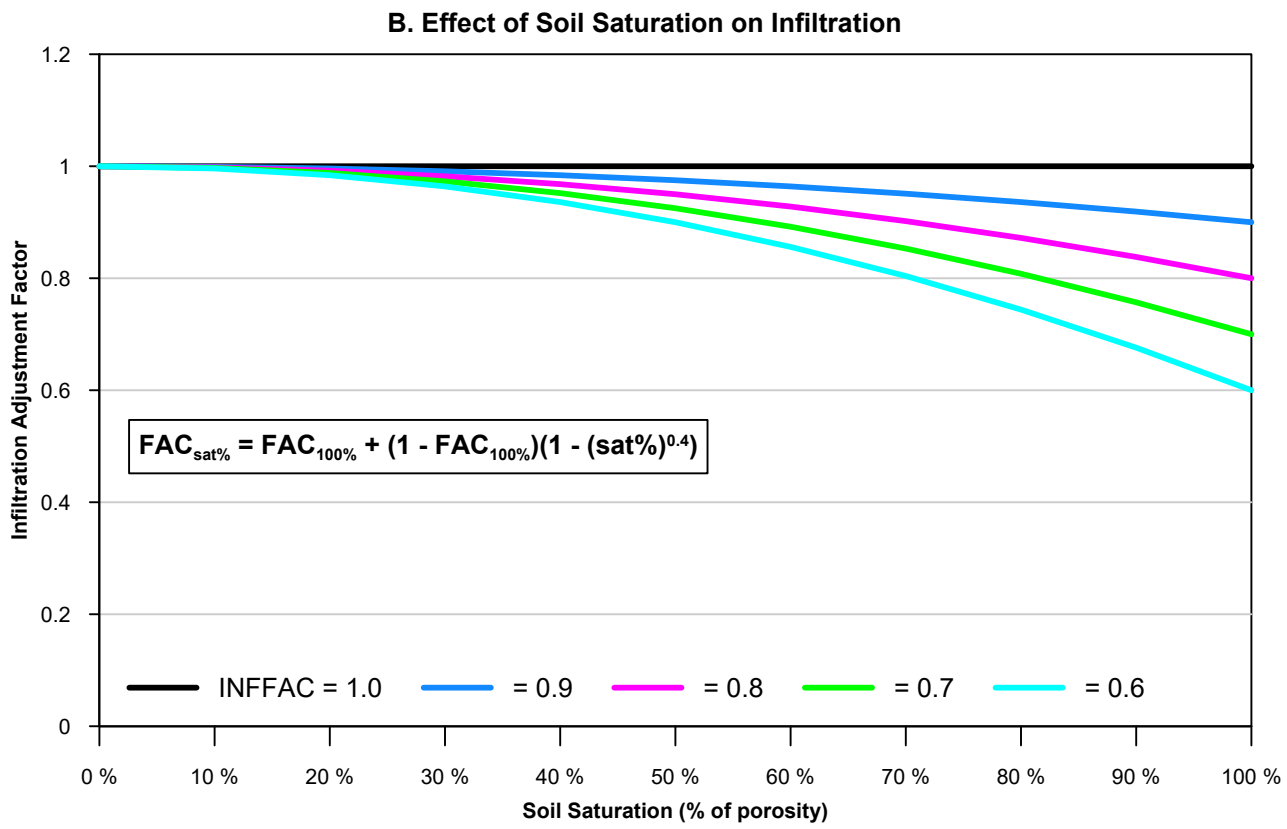
Source: PRISM_ppt_30yr_normal_4kmM2_annual_bil

February 2020

TODD GROUNDWATER

Figure G-7
Average Annual Precipitation





Data:
T:\Projects\San Benito GSP 37643\Model\RCH\Antecedent_moisture_adjustment.xls Sheet1

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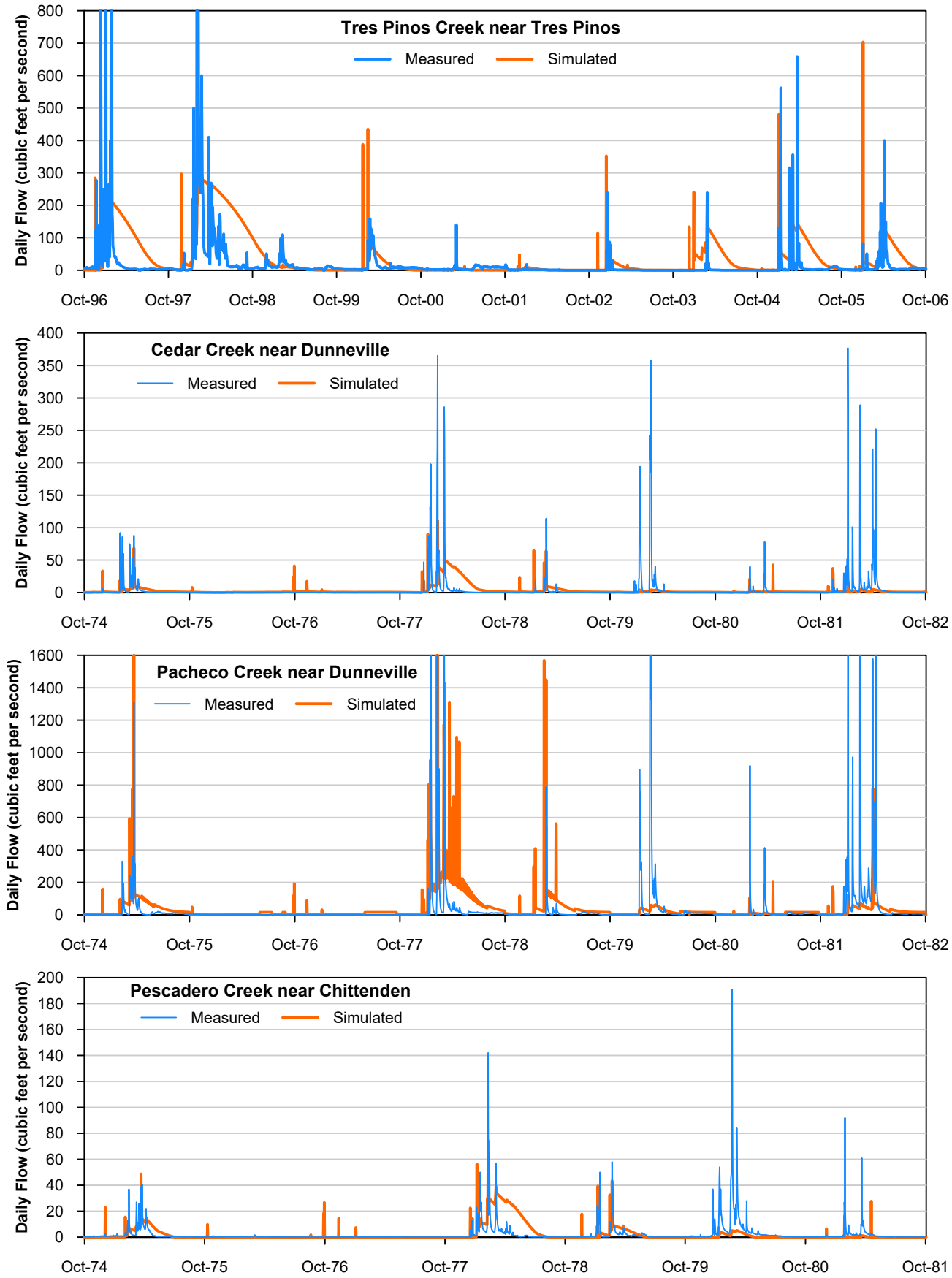
TODD GROUNDWATER

Figure G-8
Relationship of Infiltration to Throughfall and Soil Saturation

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-8 Relationship of Infiltration to Throughfall and Soil Saturation.gpj



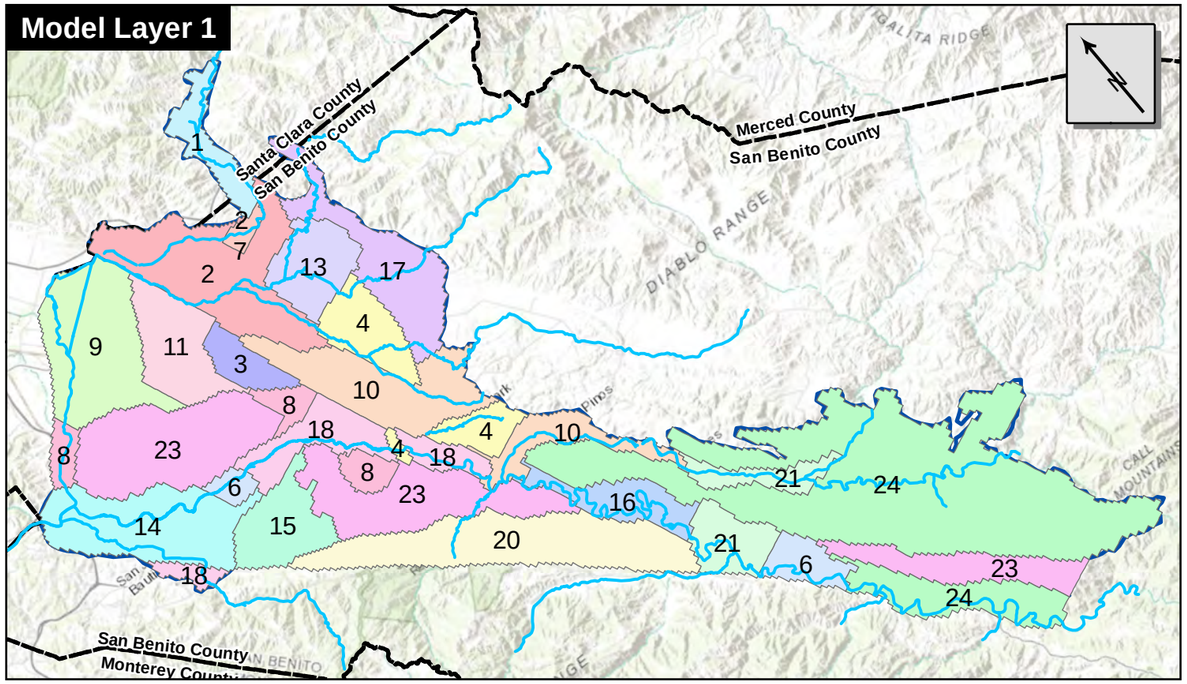
Data:
T:\Projects\San Benito GSP 37643\Model\RCH\RechargeSimStreamQ.xlsx
Sheet: RechargeSimstreamQ
Columns: BL-BV

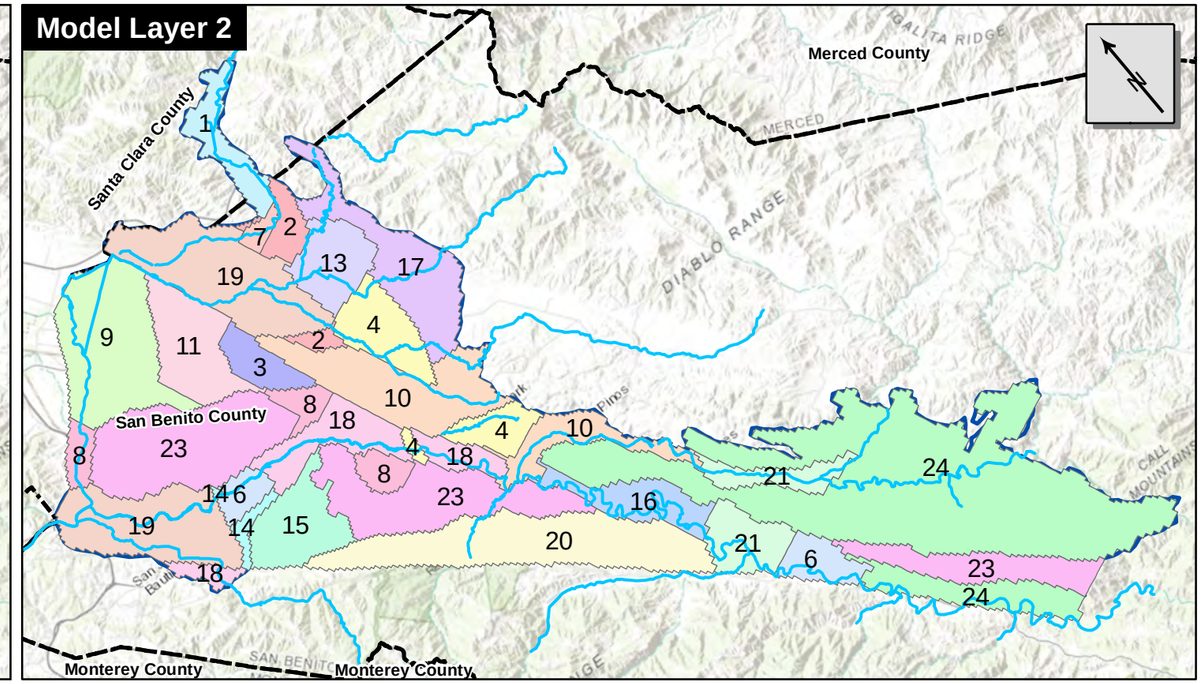
February 2020

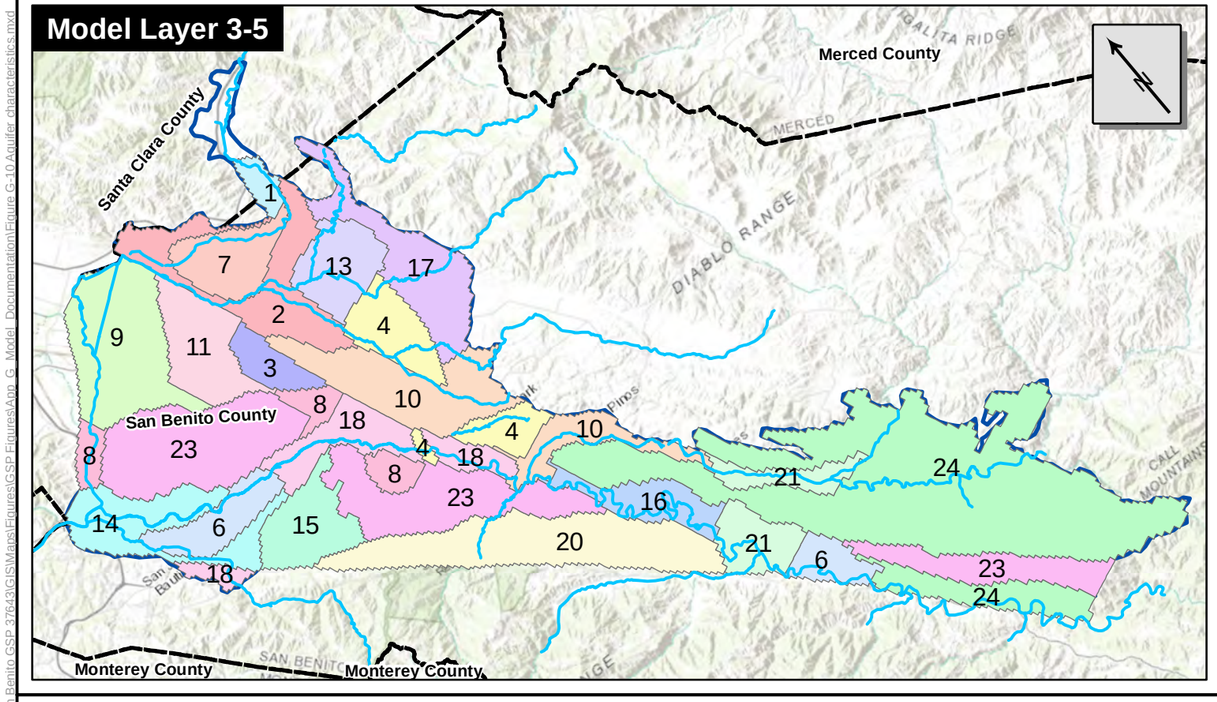
TODD GROUNDWATER

Figure G-9
Measured and Simulated Daily Stream Flows

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-9 Measured and Simulated Stream Flows.gpj







Map No.	Kh	Kv	S_0	Sy	Map No.	Kh	Kv	S_0	Sy
1	140	2	7.00E-05	0.07	13	11	0.5	5.00E-05	0.1
2	4	0.05	2.00E-05	0.1	14	4	0.02	7.00E-05	0.15
3	60	0.5	5.00E-06	0.02	15	1.5	0.3	7.00E-05	0.15
4	4	0.5	7.00E-05	0.07	16	4	0.5	7.00E-05	0.1
5	60	0.05	7.00E-05	0.15	17	4	0.5	5.00E-05	0.1
6	120	5	7.00E-05	0.15	18	70	0.1	1.00E-04	0.18
7	100	0.5	1.00E-05	0.01	19	1	0.005	5.00E-05	0.1
8	3	0.1	2.00E-04	0.1	20	1	0.01	5.00E-05	0.1
9	20	1	5.00E-06	0.02	21	80	0.05	5.00E-05	0.12
10	6	0.5	7.00E-05	0.1	22	4	0.2	5.00E-05	0.15
11	6	0.1	5.00E-06	0.02	23	0.2	0.02	1.50E-05	0.05
12	100	1	2.00E-05	0.1	24	0.8	0.08	5.00E-05	0.1

Kh = horizontal hydraulic conductivity (feet per day)
Kv = vertical hydraulic conductivity (feet per day)
So = Specific storativity (per foot)
Sy = Specific yield (dimensionless)

0 2 4
Scale in Miles

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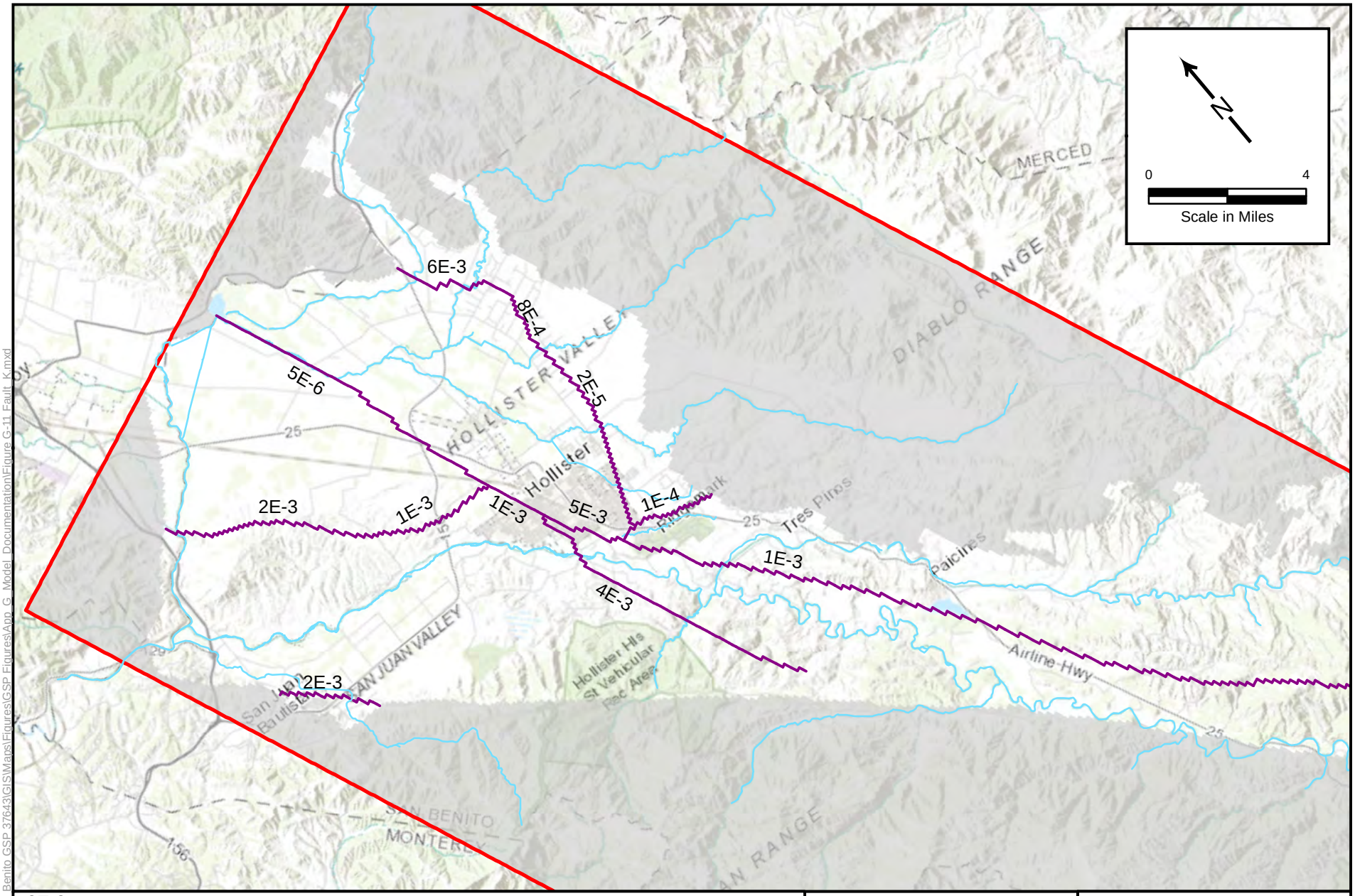
TODD GROUNDWATER

Figure G-10
Calibrated Aquifer Characteristics

Path: T:\Projects\San Benito GSP 37643\GIS\Maps\Figures\GSP Figures\App G_Model_Documentation\Figure G-10 Aquifer characteristics.mxd



2E-3 Fault cells with hydraulic conductivity in feet per day assuming fault plane is 1 foot thick

Model grid outline

Inactive cells

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Figure G-11
Fault Plane Permeabilities

Path: T:\Projects\San Benito GSP 37643\GIS\Maps\Figures\GSP Figures\App G_Model Documentation\Figure G-11 Fault_K.mxd

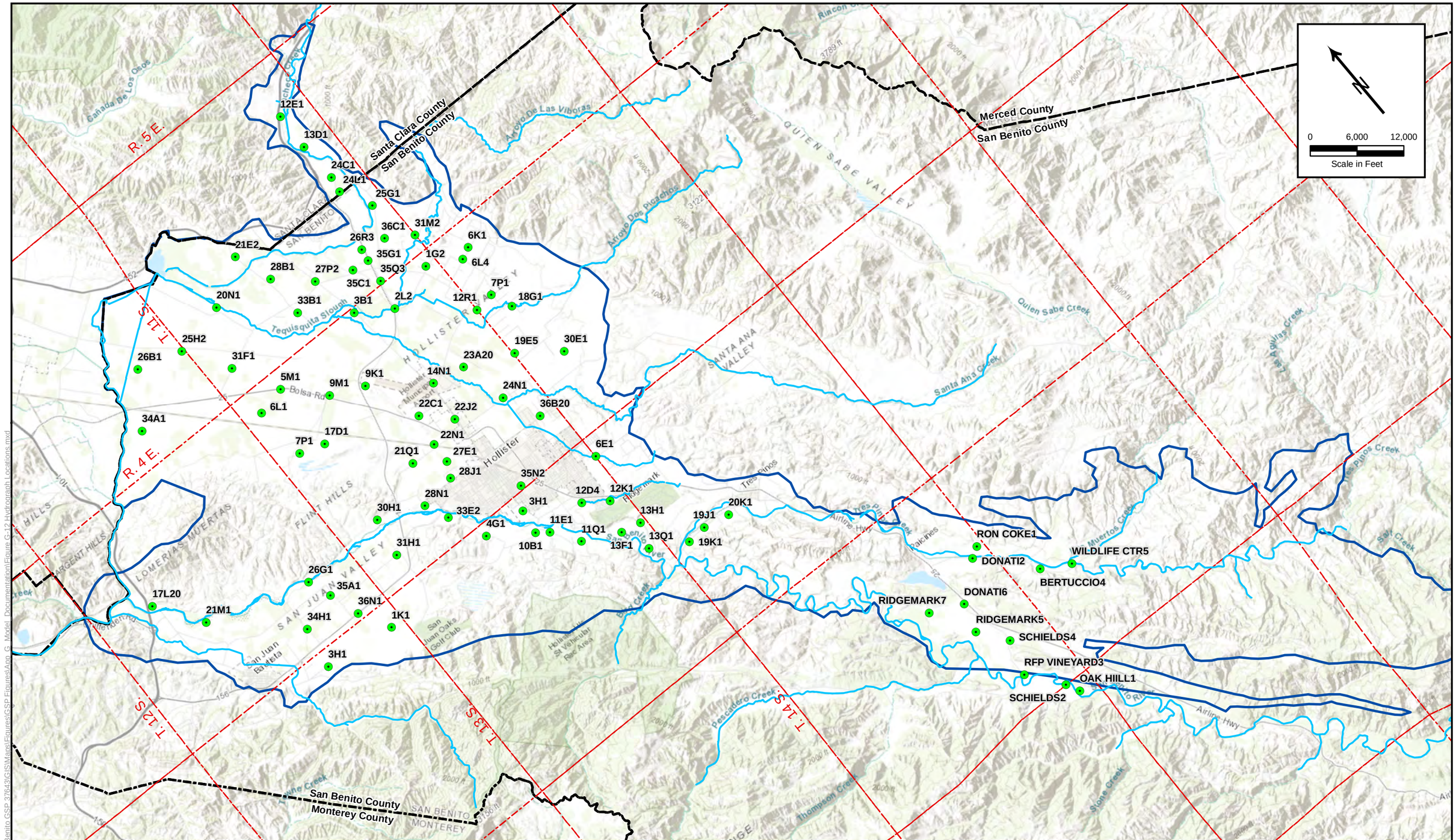

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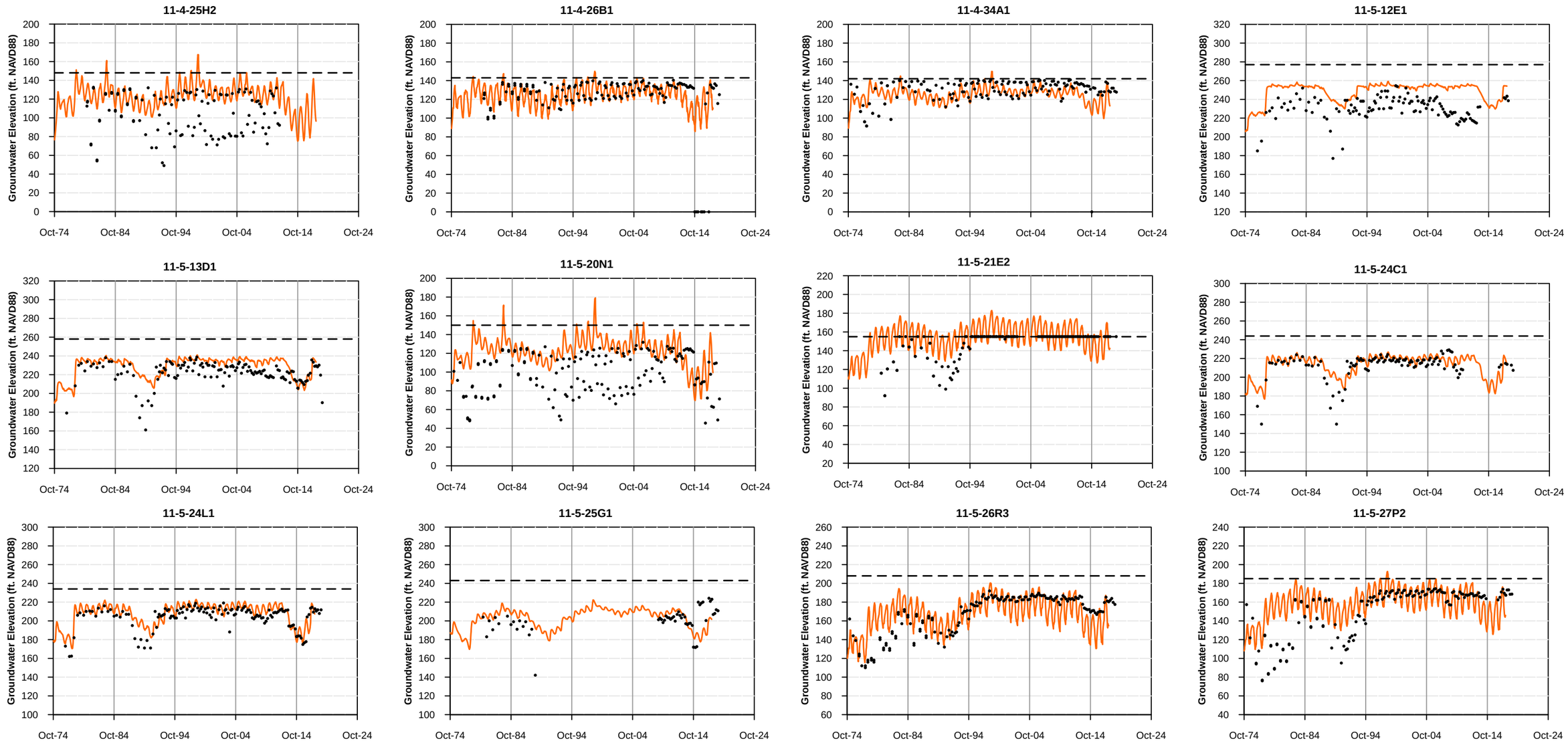
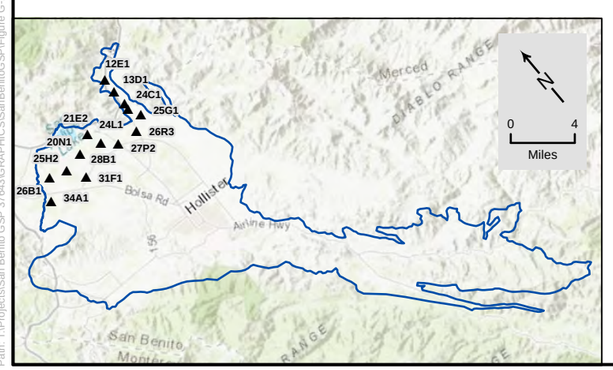
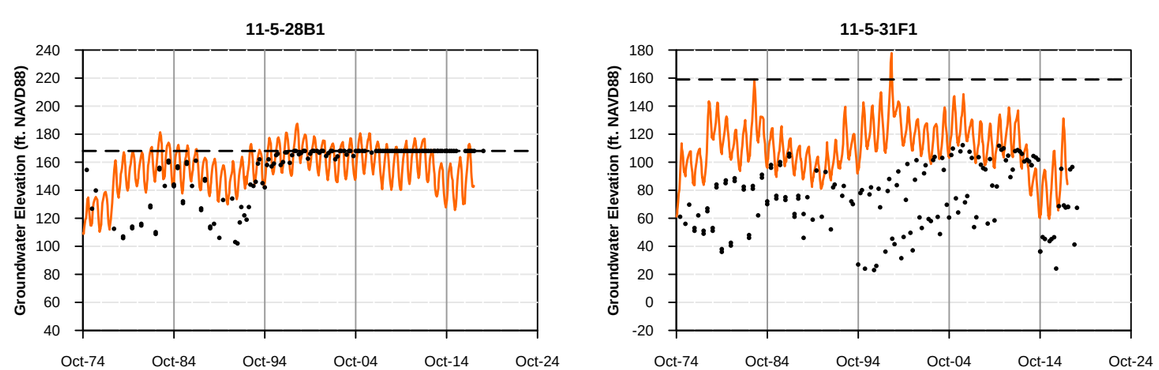
Figure G-12
Locations of Hydrograph Wells

Path: T:\Projects\San Benito GSP 37643\GIS\Maps\Figures\GSP Figures\App G Model Documentation\Figure G-12 Hydrograph Locations.mxd







- Measured
- Simulated Layer
- Ground Surface

Data:
T:\Projects\San Benito GSP 37643\Model\Water_Levels\Hydrographs7517.xlsm

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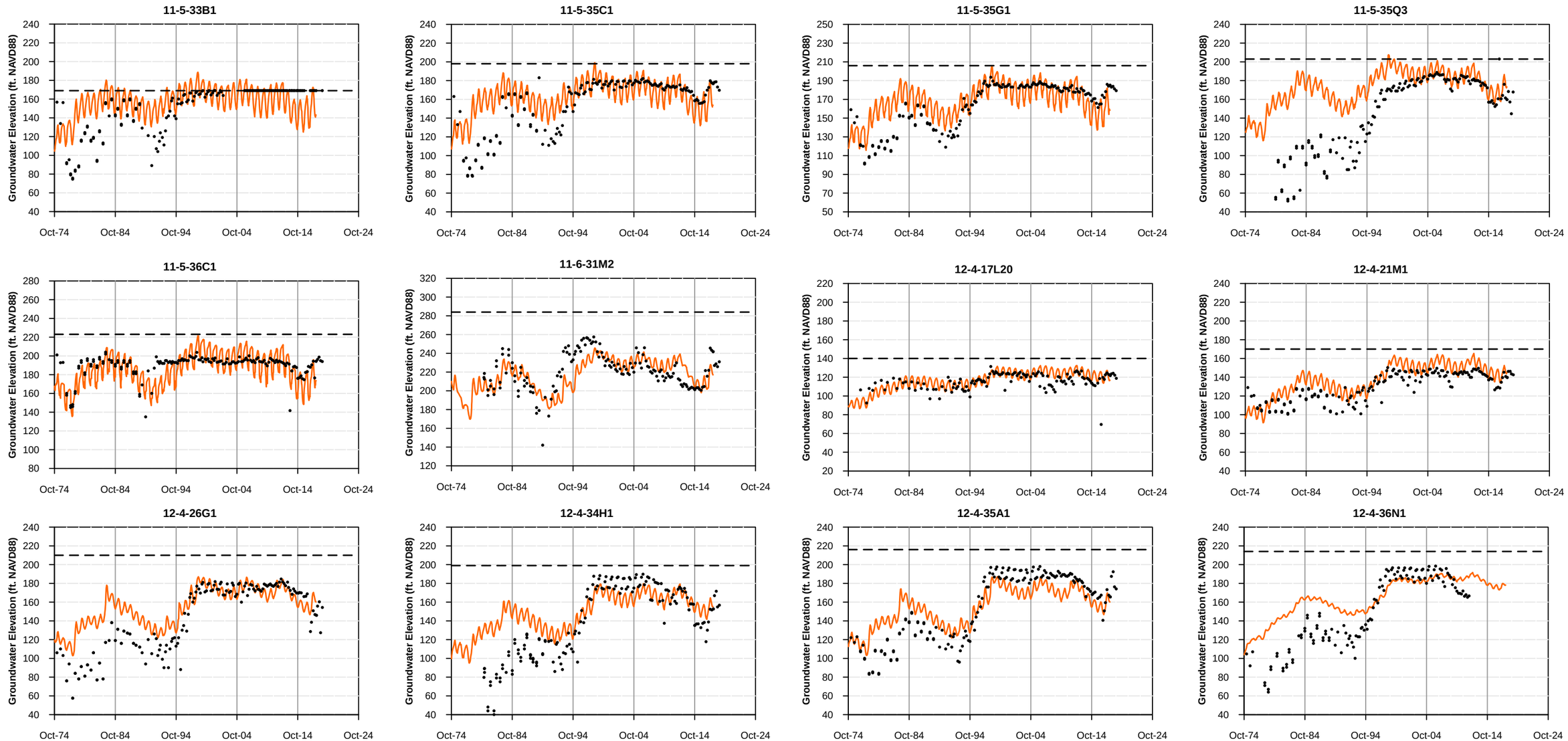
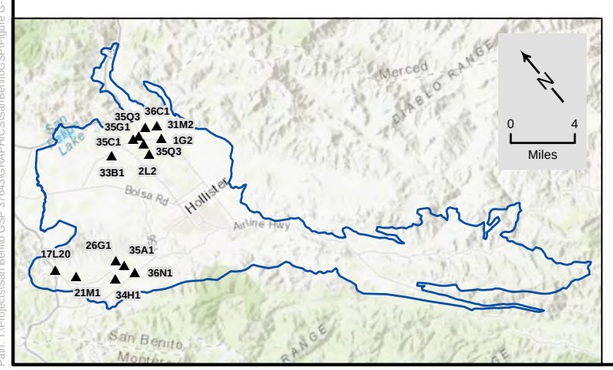
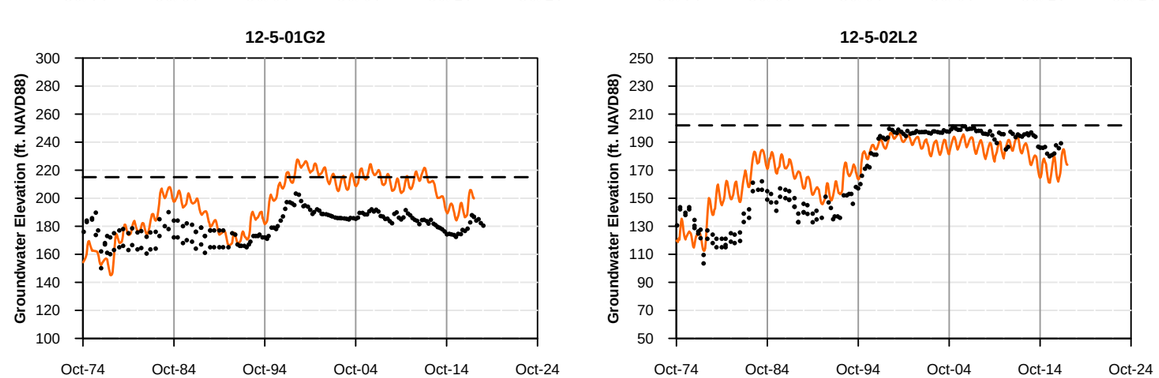
Figure G-13a
Calibration Hydrographs

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-13a Calibration Hydrographs.gpj







- Measured
- Simulated Layer
- Ground Surface

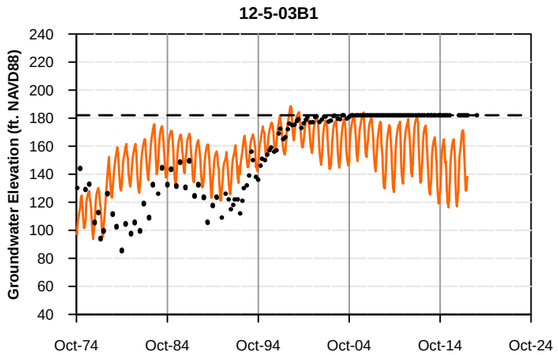
Data:
T:\Projects\San Benito GSP 37643\Model\Water_Levels\Hydrographs7517.xlsm

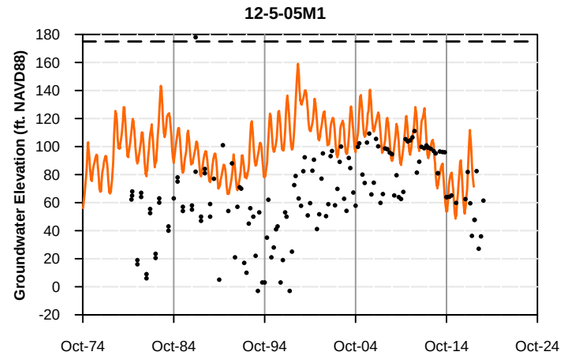
February 2020

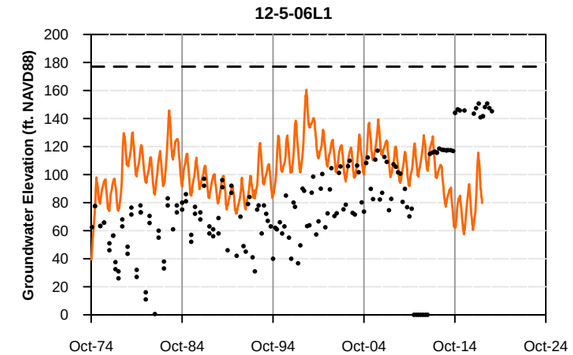
TODD GROUNDWATER

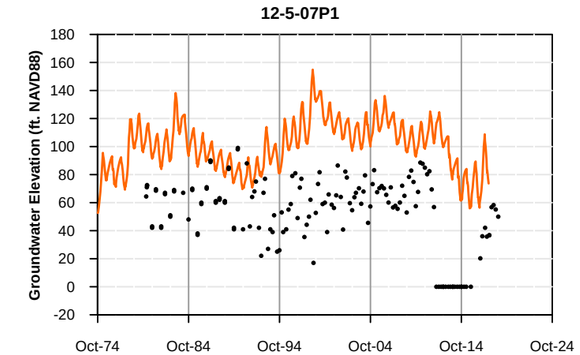
Figure G-13b
Calibration Hydrographs

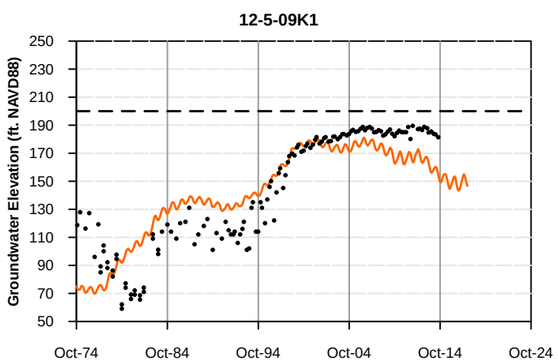
Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-13b Calibration Hydrographs.gpj

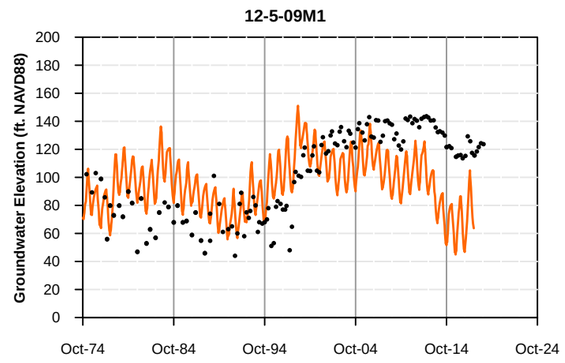


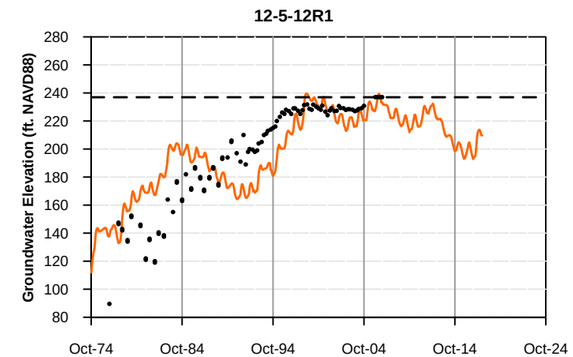


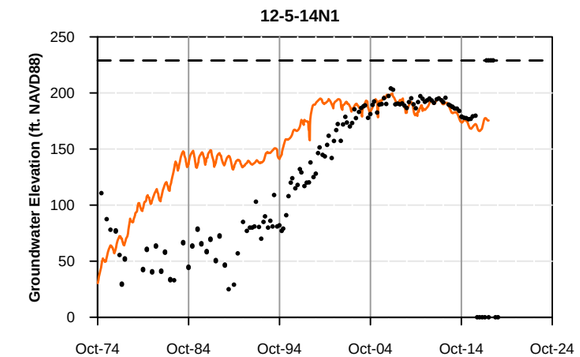


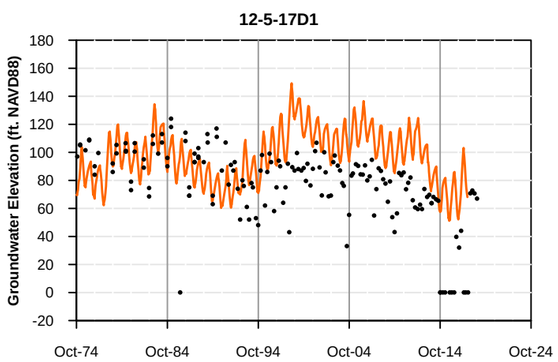


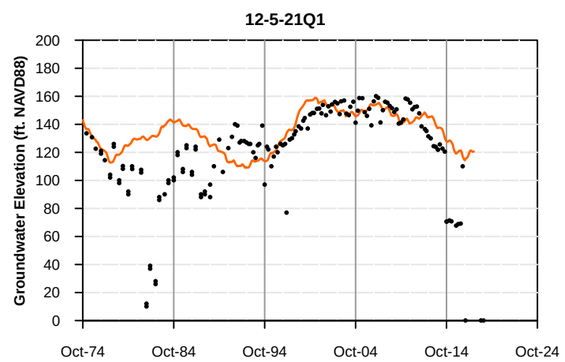


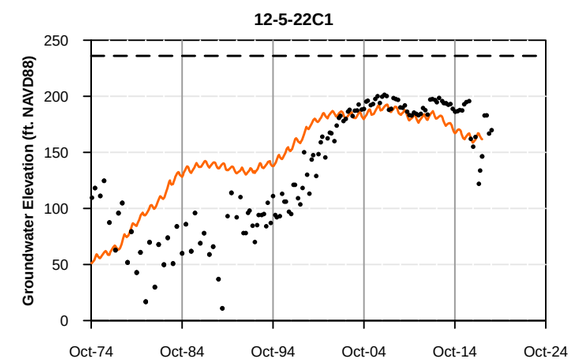


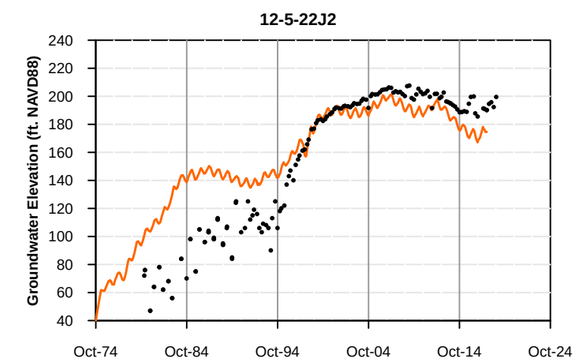


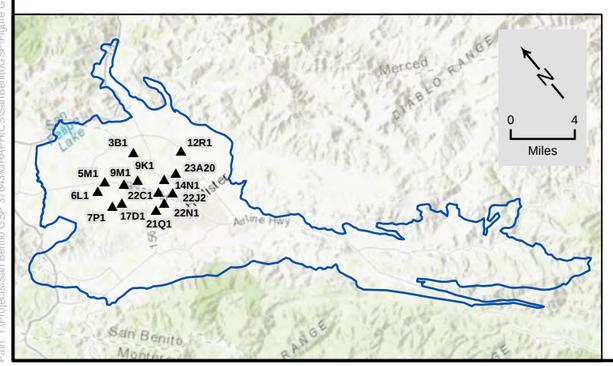


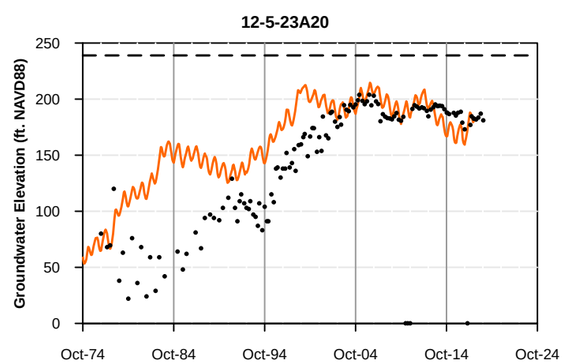












Measured
Simulated Layer
Ground Surface

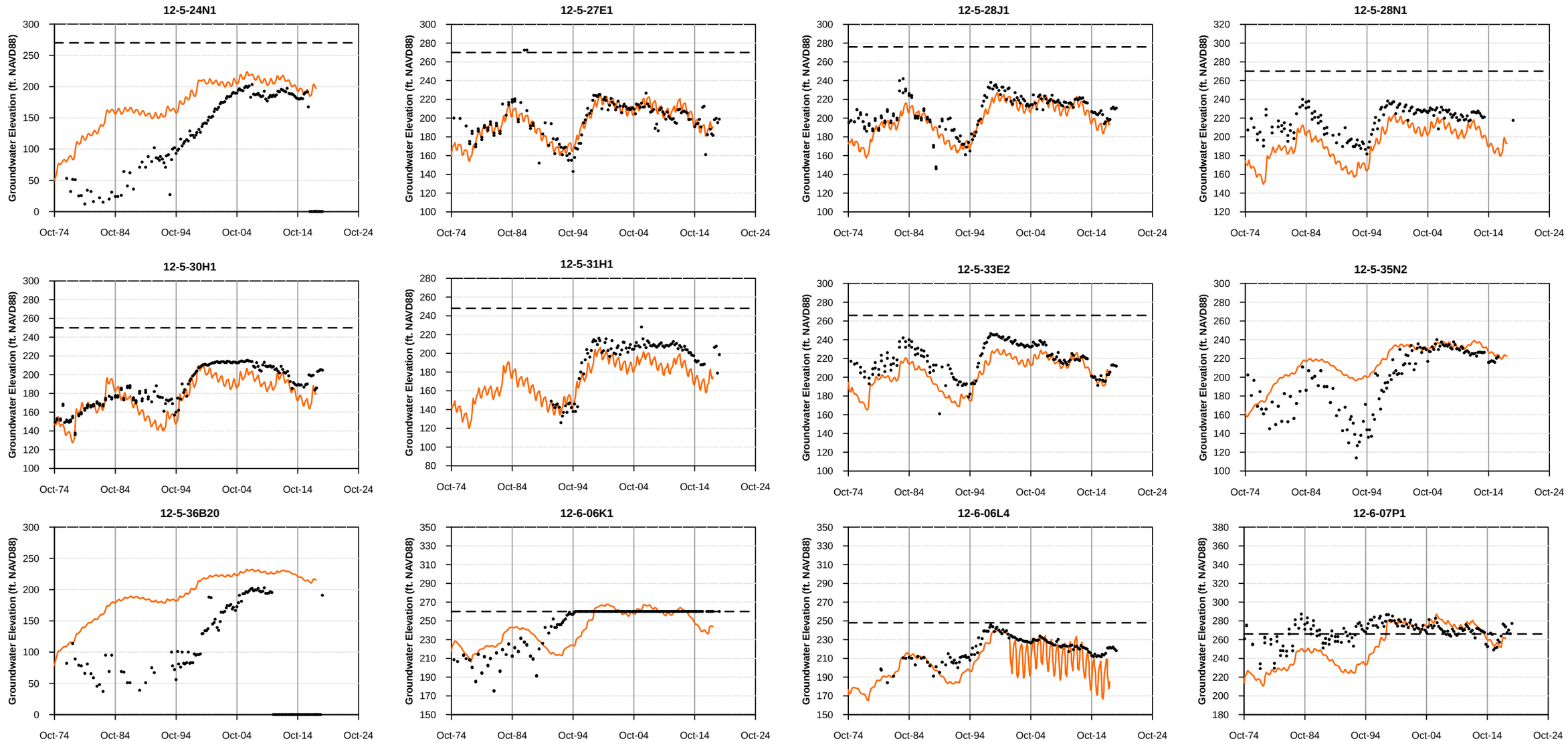
Data:
T:\Projects\San Benito GSP 37643\Model\Water_Levels\Hydrographs7517.xlsm

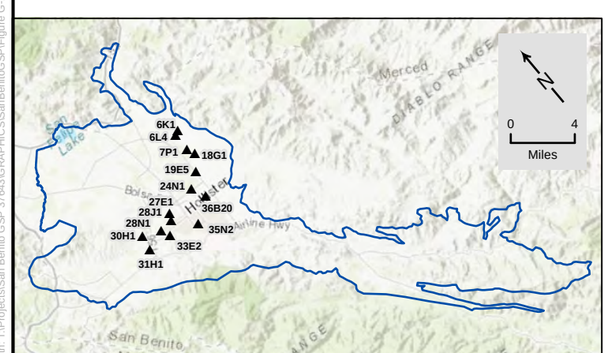
February 2020

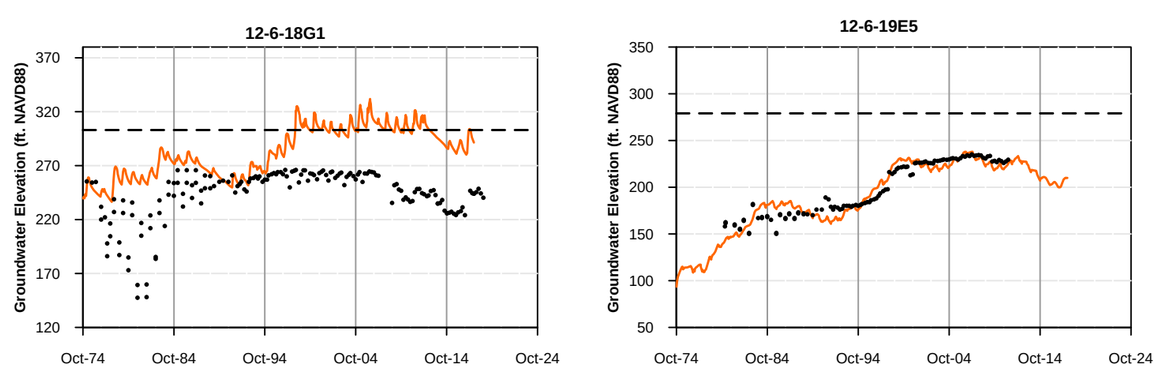
TODD GROUNDWATER

Figure G-13c
Calibration Hydrographs

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-13c Calibration Hydrographs.gpj







Measured
Simulated Layer
Ground Surface

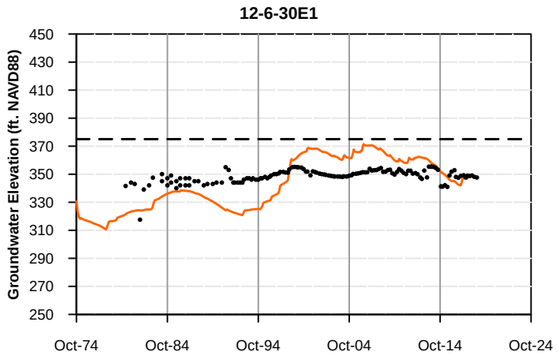
Data:
T:\Projects\San Benito GSP 37643\Model\Water_Levels\Hydrographs7517.xlsm

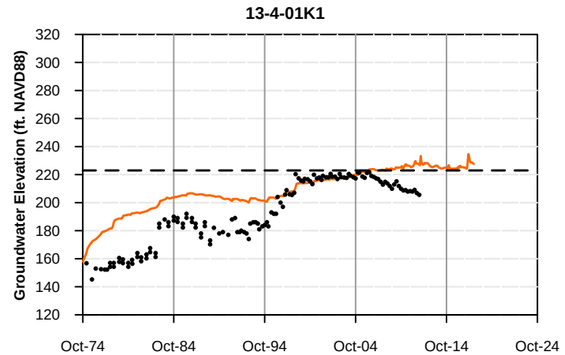
February 2020

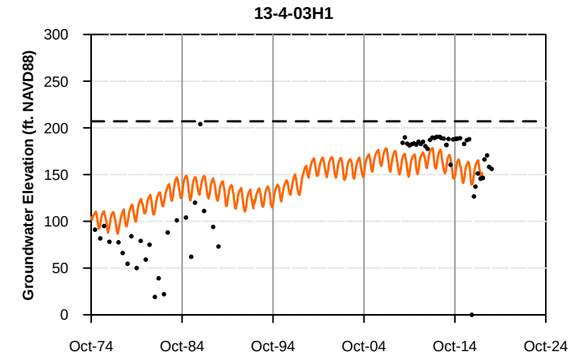
TODD GROUNDWATER

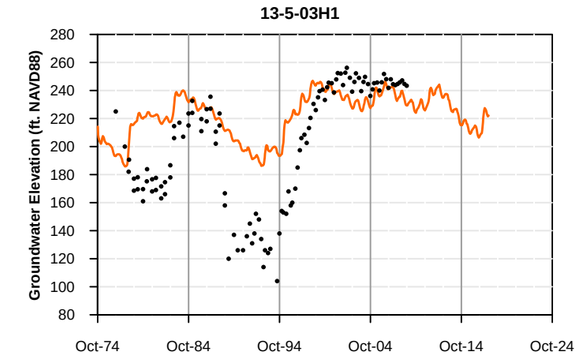
Figure G-13d
Calibration Hydrographs

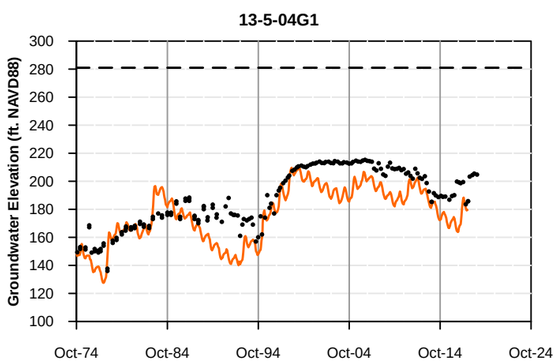
Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-13d Calibration Hydrographs.gpj

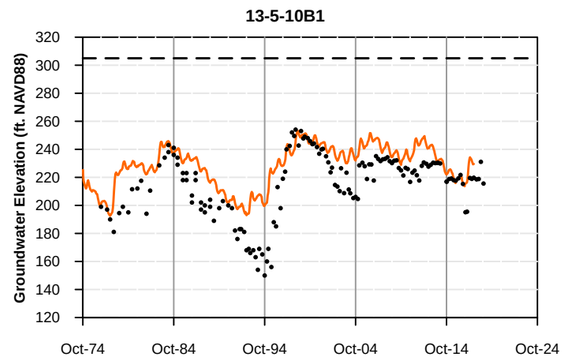


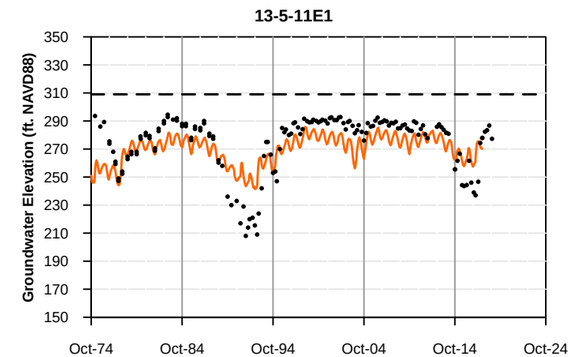


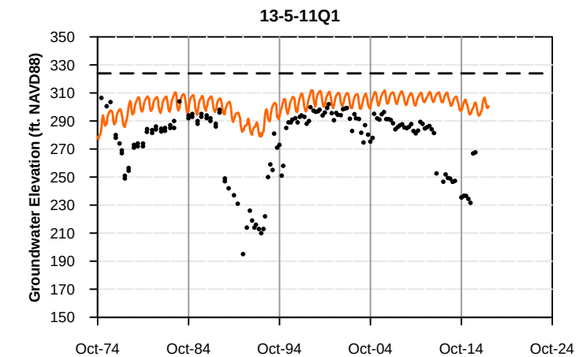


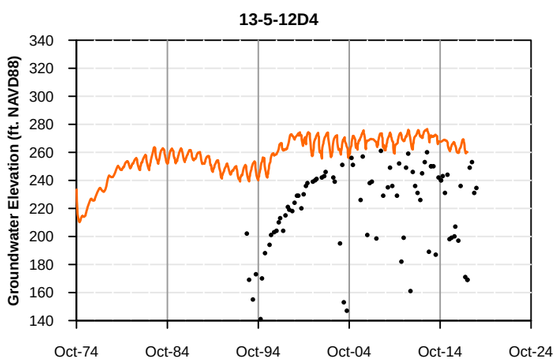


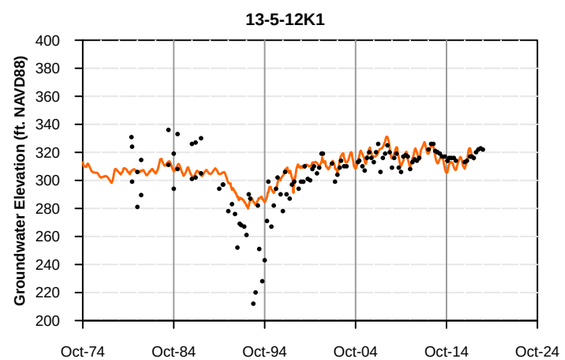


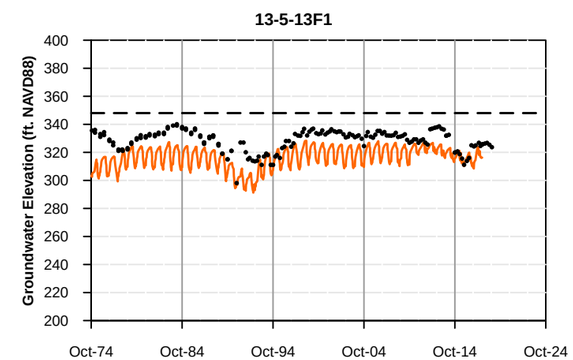


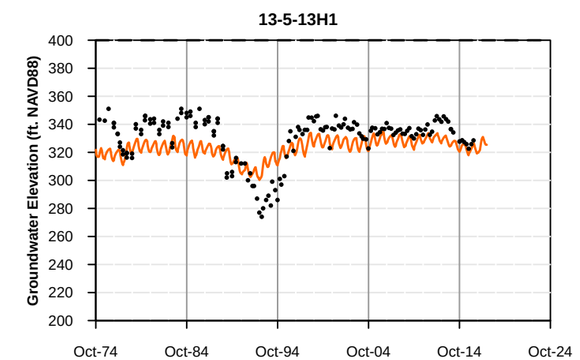


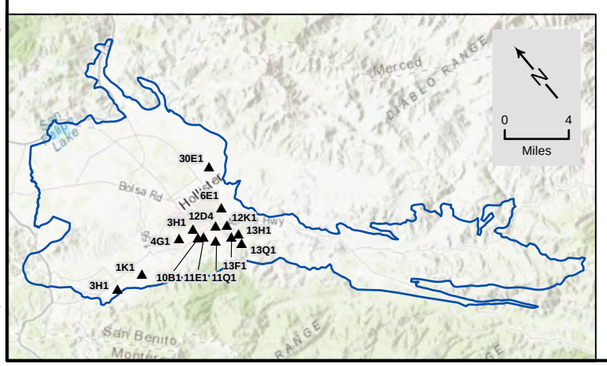


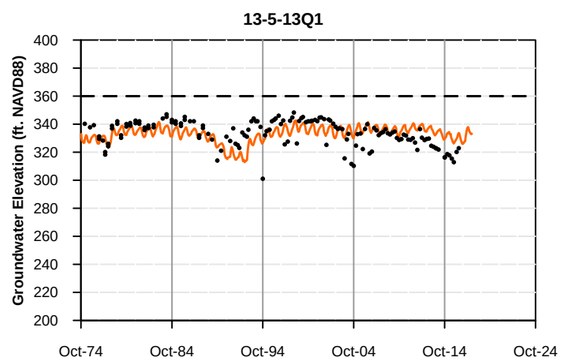


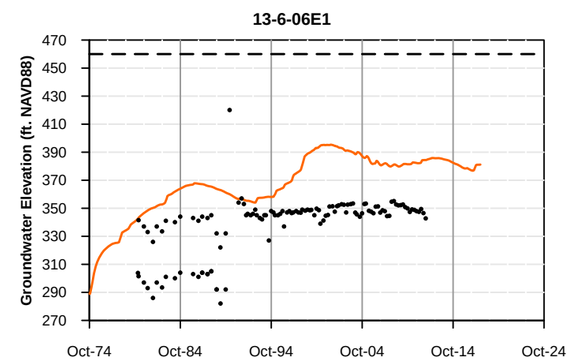












Measured
Simulated Layer
Ground Surface

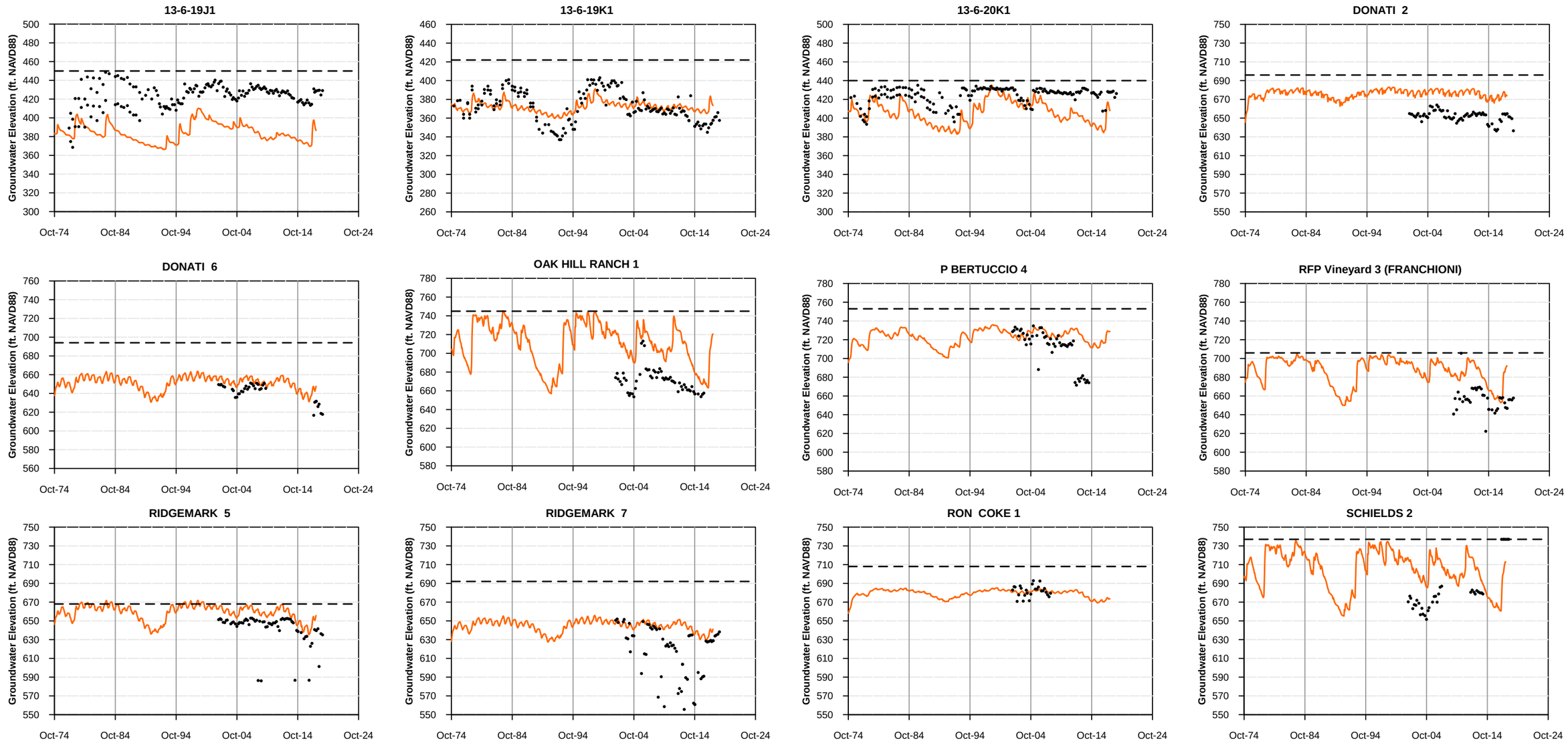
Data:
T:\Projects\San Benito GSP 37643\Model\Water_Levels\Hydrographs7517.xlsm

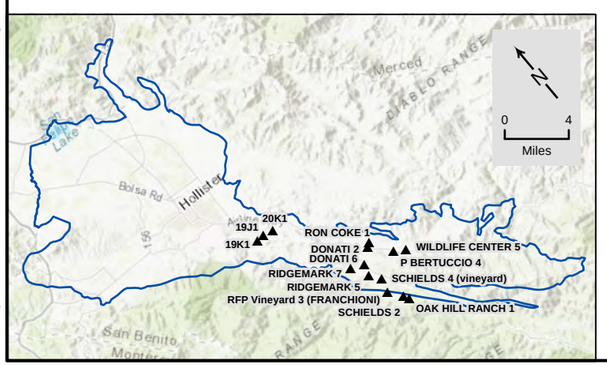
February 2020

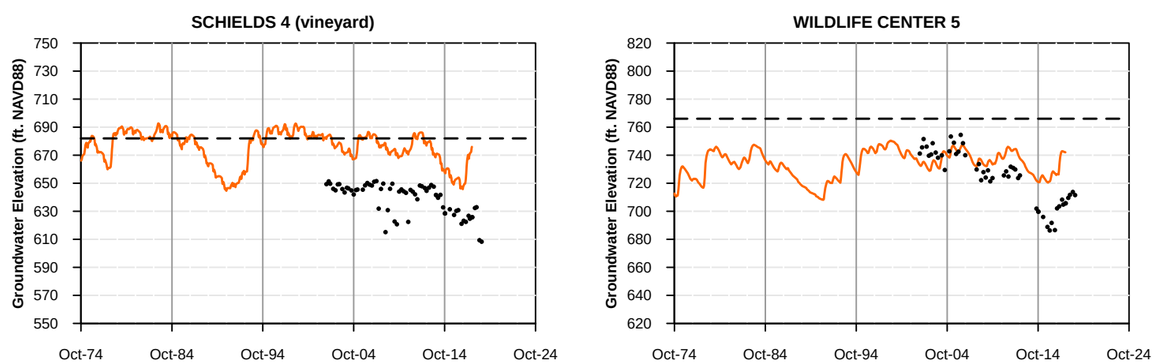
TODD GROUNDWATER

Figure G-13e
Calibration Hydrographs

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-13e Calibration Hydrographs.gpj







- Measured
- Simulated Layer
- Ground Surface

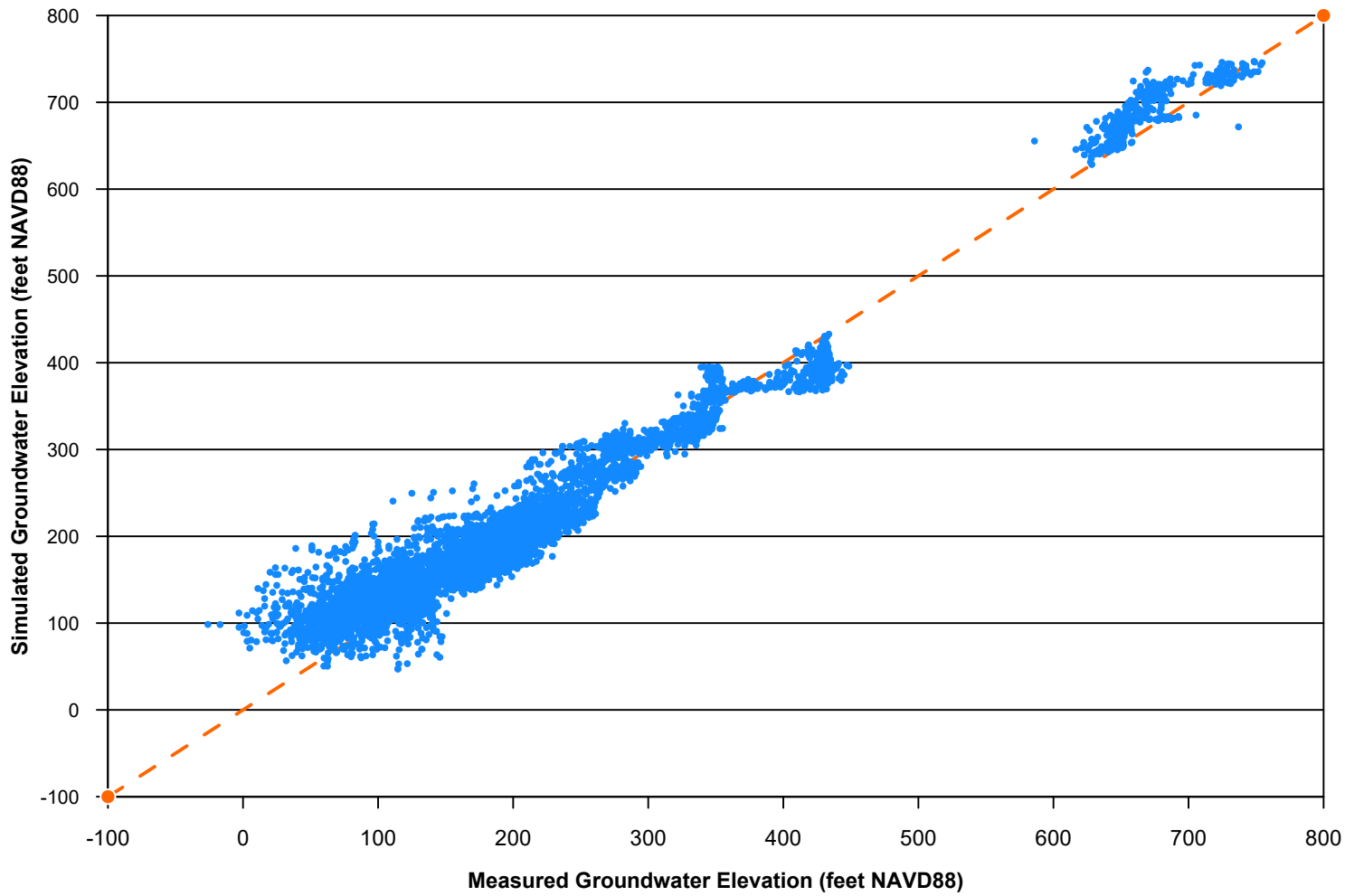
Data:
T:\Projects\San Benito GSP 37643\Model\Water_Levels\Hydrographs7517.xlsm

February 2020

TODD GROUNDWATER

Figure G-13f
Calibration Hydrographs

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-13f Calibration Hydrographs.grl



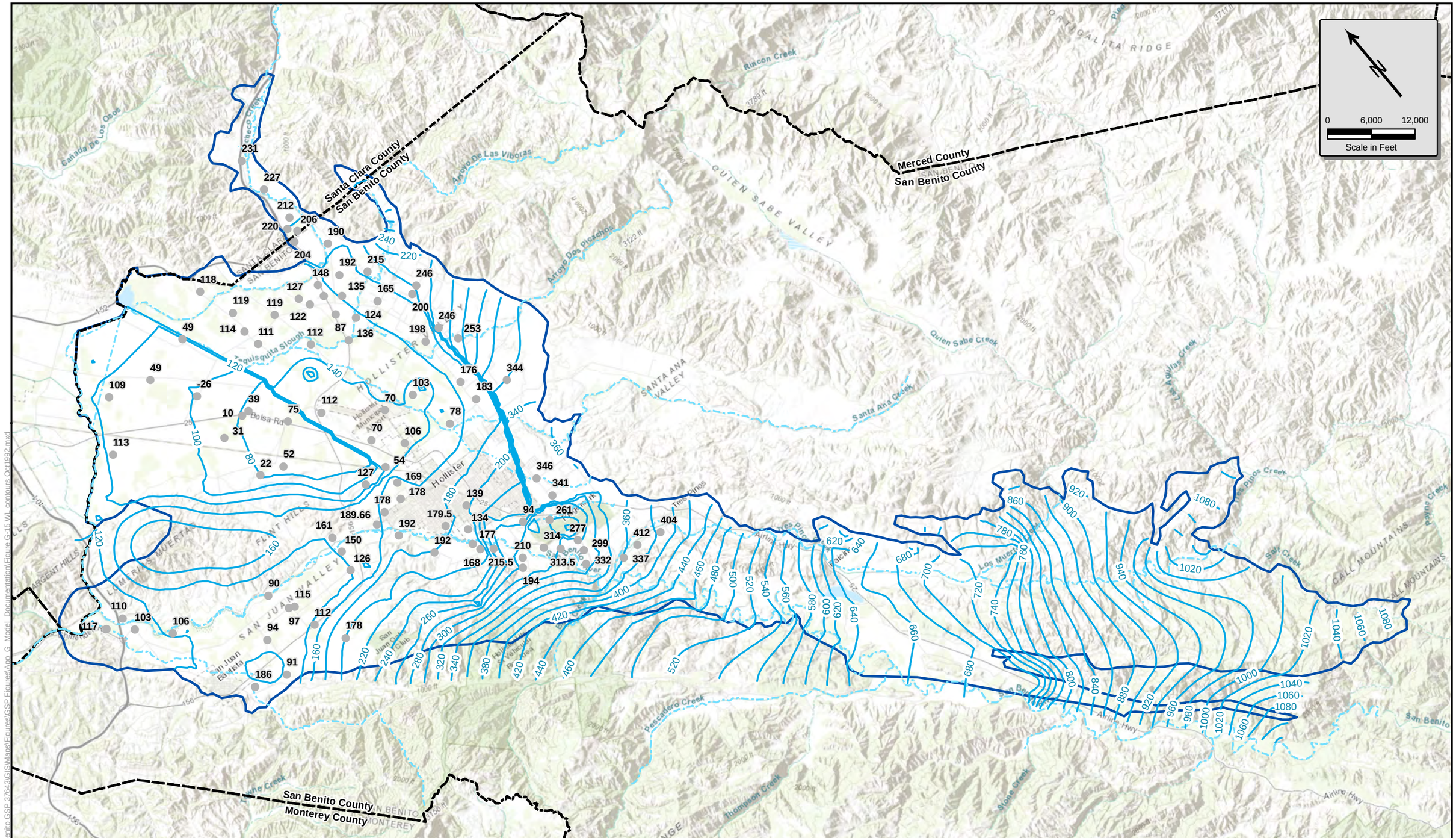
Data:
T:\Projects\San Benito GSP 37643\Model\Water_Levels\Run054c_Calibration.xlsx Run054c_Calibration

February 2020

TODD GROUNDWATER

Figure G-14
Scatterplot of Simulated versus Measured Water Levels

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-14 Scatterplot of Simulated versus Measured Water Levels.gpj

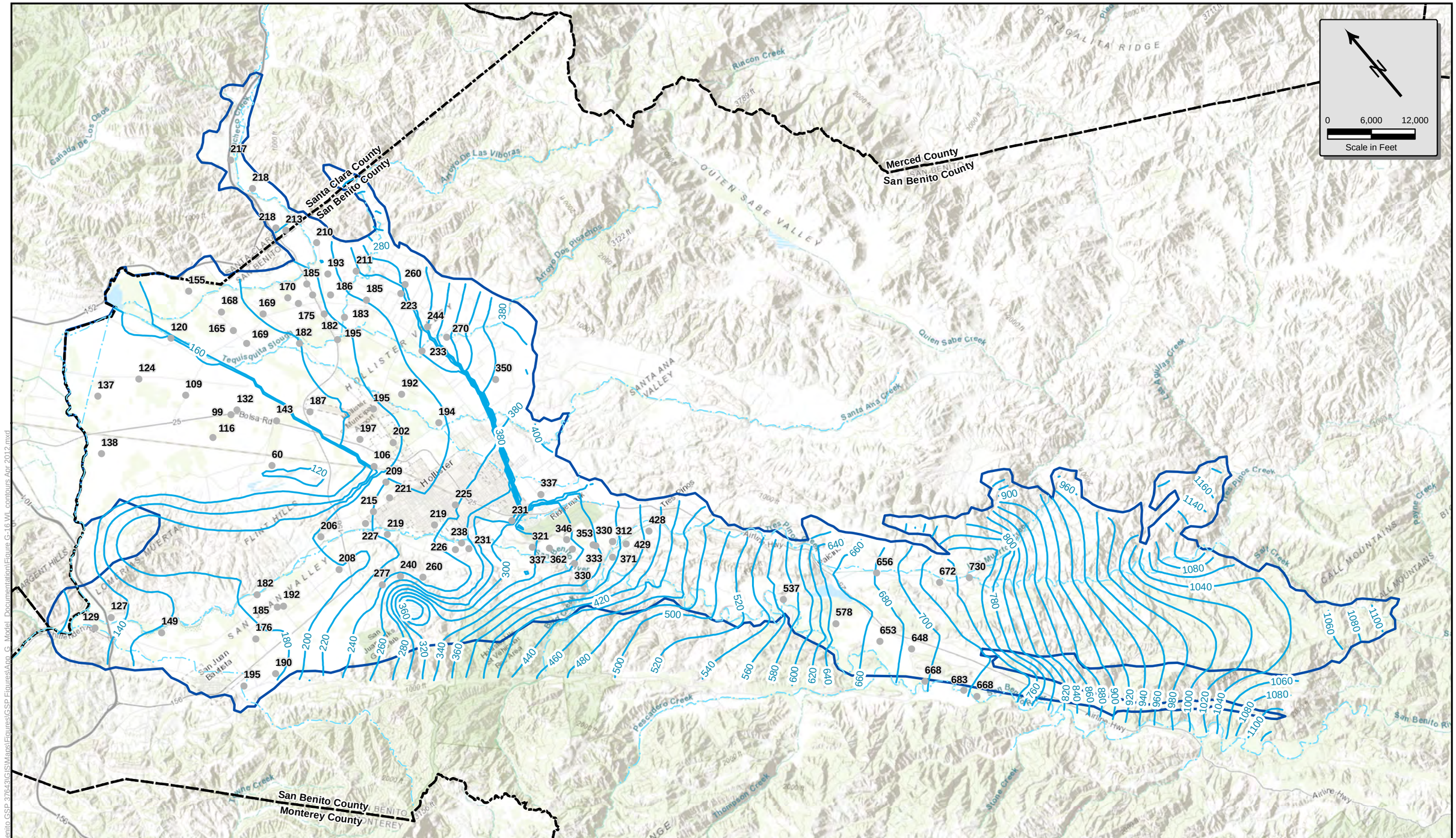


February 2020

TODD GROUNDWATER

Figure G-15
Simulated Groundwater Elevation
October 1992

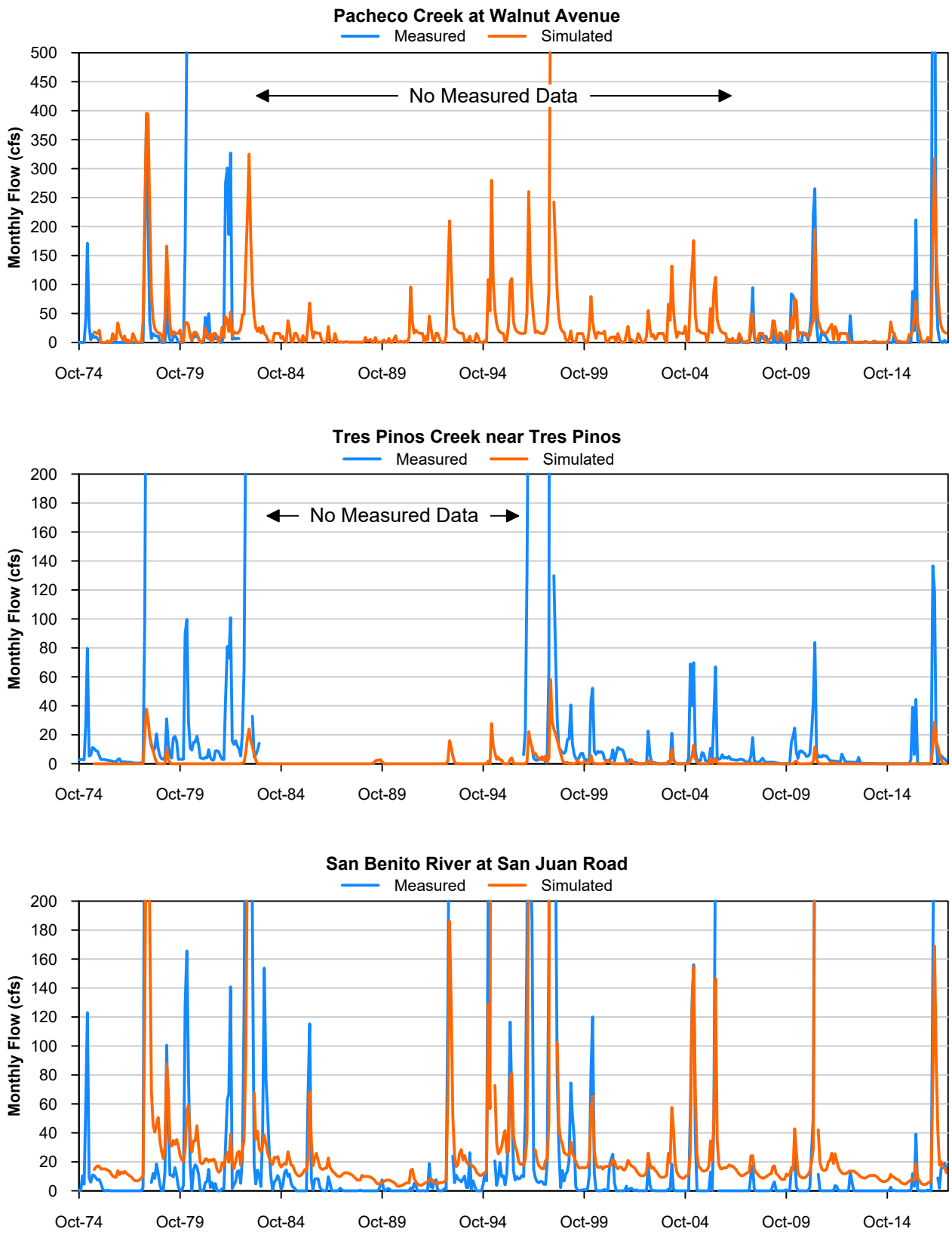
Path: T:\Projects\San Benito GSP 27643\GIS\Maps\Figures\GSP Figures\App G Model Documentation\Figure G-15 WL contours Oct1992.mxd



February 2020

TODD GROUNDWATER

Figure G-16
Simulated Groundwater Elevation
April 2012



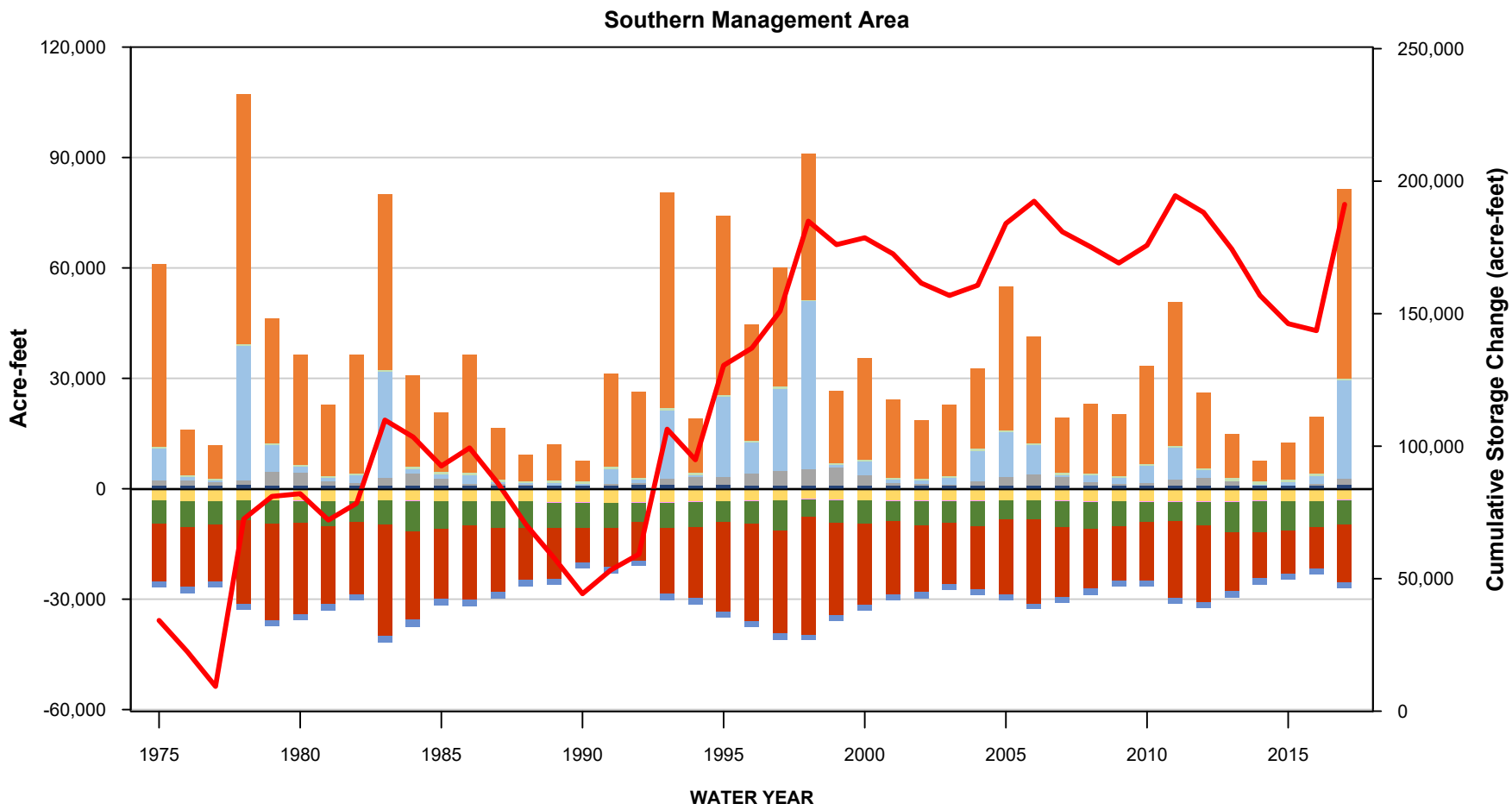
Data:
T:\Projects\San Benito GSP 37643\Model\GWV\SB7517_gage_str_35locations.xlsx Measured

February 2020

TODD GROUNDWATER

Figure G-17
Simulated and Measured Monthly Stream Flows

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-17 Simulated and Measured Monthly Stream Flows.gpj



Inflows

- Subsurface Inflow from Llagas Subbasin
- Reclaimed water percolation
- Irrigation deep percolation
- Dispersed recharge from rainfall
- Bedrock inflow
- Percolation from streams
- Shallow discharge to streams
- Inflow from Other MAs

Outflows

- Subsurface outflow to Llagas Subbasin
- Wells - M&I and domestic
- Wells - agricultural
- Groundwater discharge to streams
- Riparian evapotranspiration
- Outflow to Other MAs
- Cumulative Storage Change

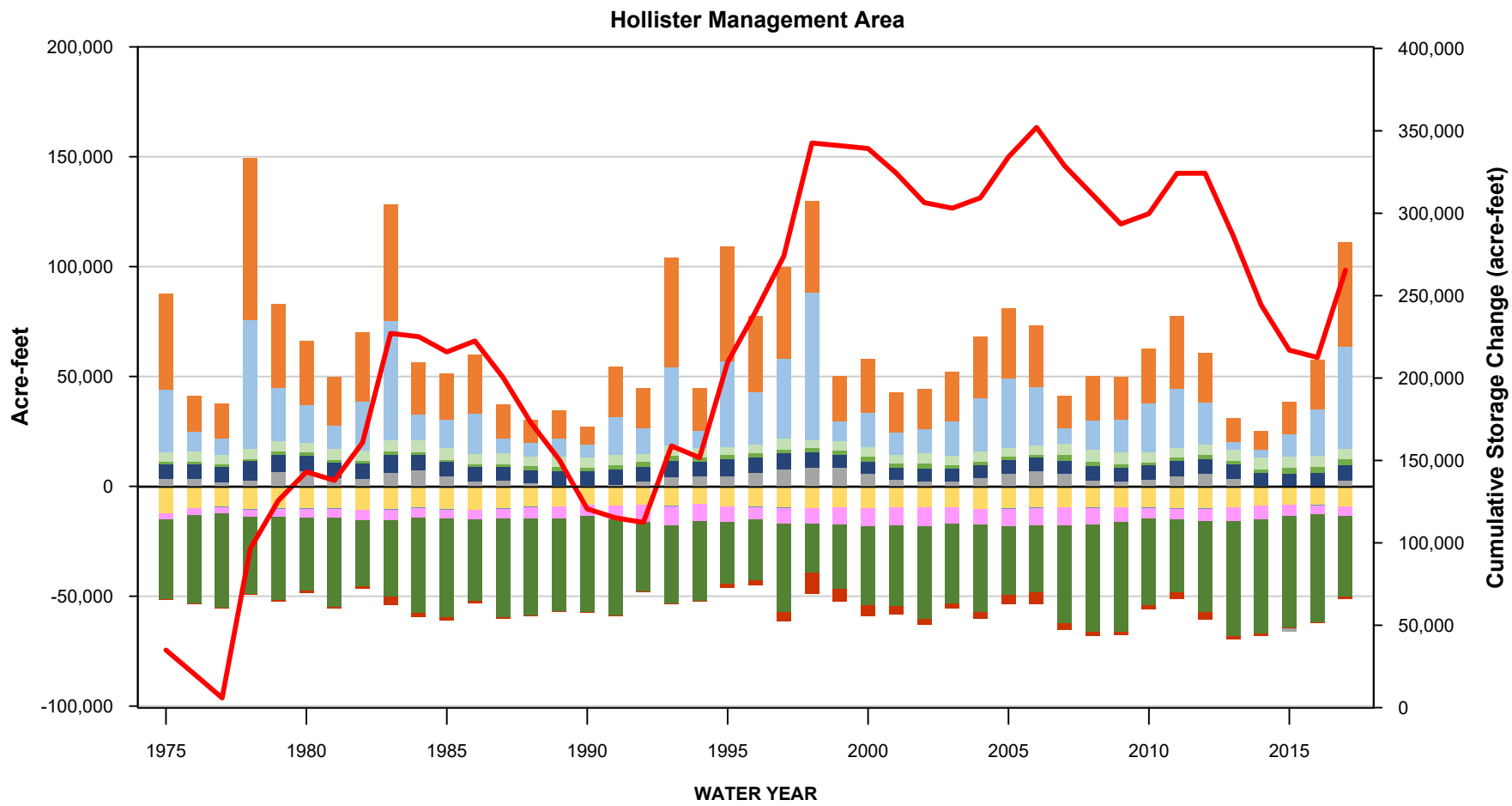
Data:
T:\Projects\San Benito GSP 37643\Model\GWV\ZBout.xlsx Run 54c

February 2020

TODD GROUNDWATER

Figure G-18 Simulated Annual Water Balances in the Southern MA

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-18 Simulated Annual Water Balances in the Southern MA.gpj



Inflows

- Subsurface Inflow from Llagas Subbasin
- Reclaimed water percolation
- Irrigation deep percolation
- Dispersed recharge from rainfall
- Bedrock inflow
- Percolation from streams
- Shallow discharge to streams
- Inflow from Other MAs

Outflows

- Outflow to Other MAs
- Subsurface outflow to Llagas Subbasin
- Wells - M&I and domestic
- Wells - agricultural
- Groundwater discharge to streams
- Riparian evapotranspiration
- Cumulative Storage Change

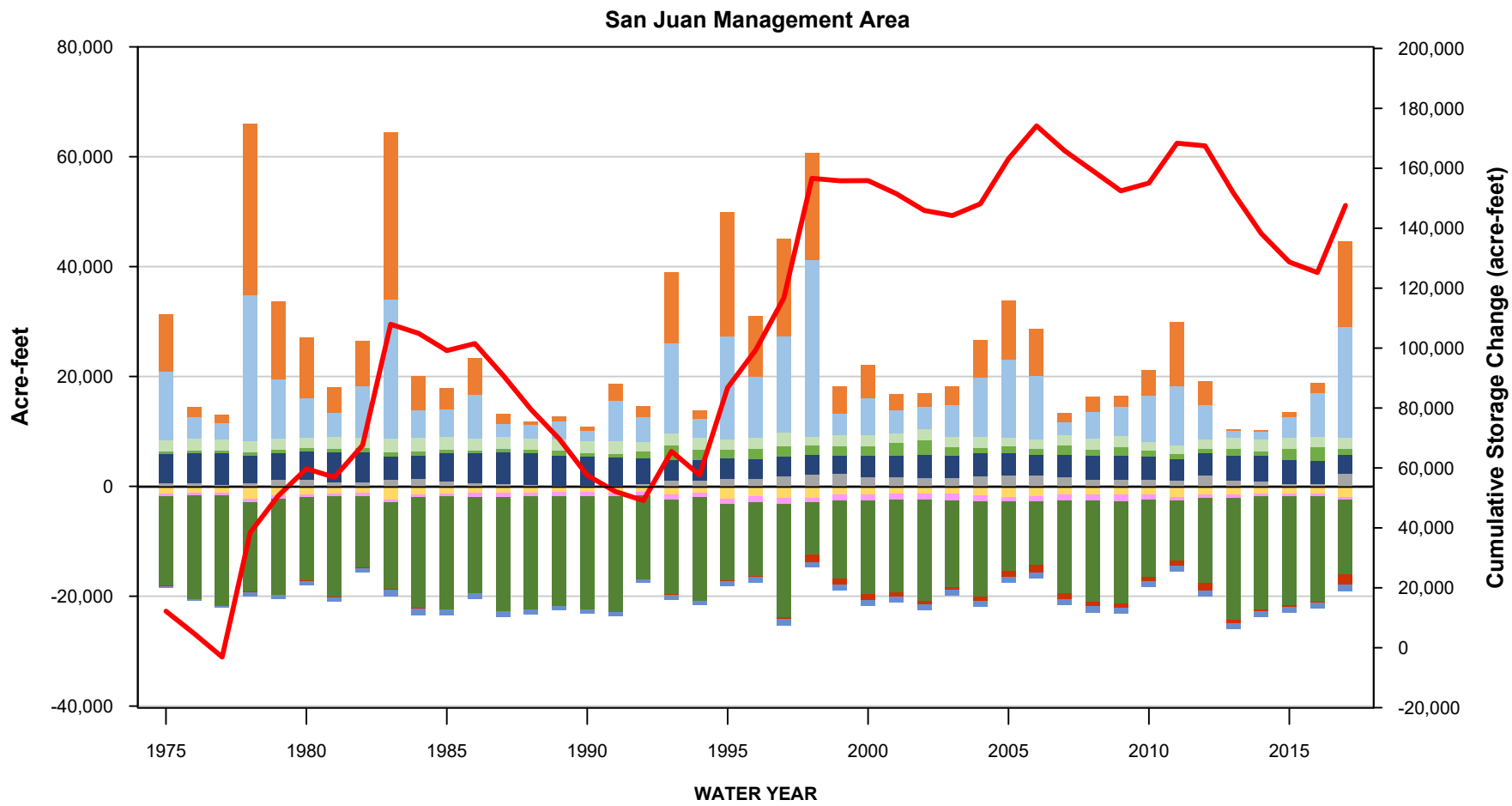
Data:
T:\Projects\San Benito GSP 37643\Model\GWV\ZBout.xlsx Run 54c

February 2020

TODD GROUNDWATER

Figure G-19
Simulated Annual Water Balances in the Hollister MA

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-19 Simulated Annual Water Balances in the Hollister MA.gpj



Inflows

- Subsurface Inflow from Llagas Subbasin
- Reclaimed water percolation
- Irrigation deep percolation
- Dispersed recharge from rainfall
- Bedrock inflow
- Percolation from streams
- Shallow discharge to streams
- Inflow from Other MAs

Outflows

- Outflow to Other MAs
- Subsurface outflow to Llagas Subbasin
- Wells - M&I and domestic
- Wells - agricultural
- Groundwater discharge to streams
- Riparian evapotranspiration
- Cumulative Storage Change

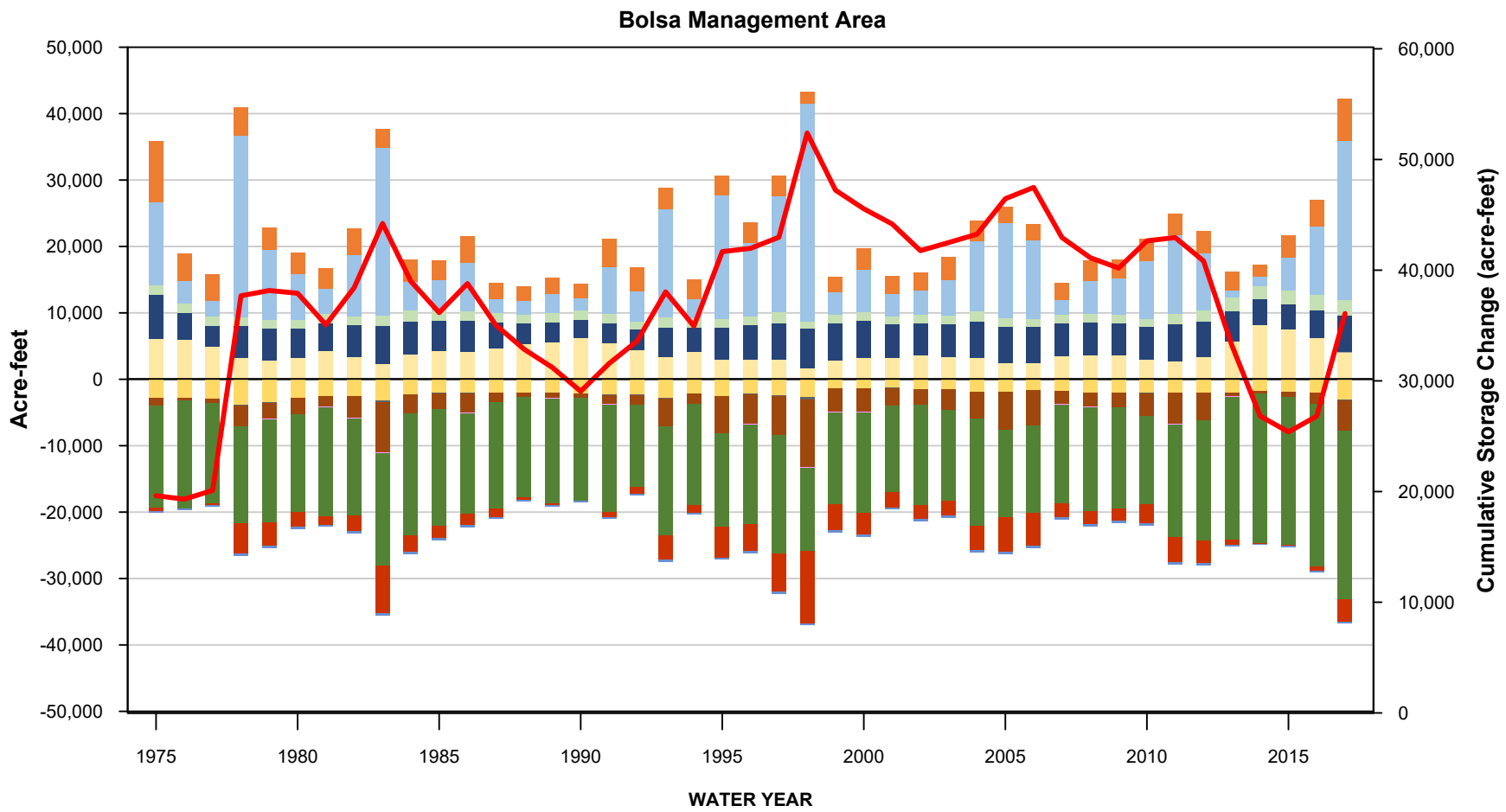
Data:
T:\Projects\San Benito GSP 37643\Model\GWV\ZBout.xlsx Run 54c

February 2020

TODD GROUNDWATER

Figure G-20 Simulated Annual Water Balances in the San Juan MA

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-20 Simulated Annual Water Balances in the San Juan MA.gpj



Inflows

- Subsurface Inflow from Llagas Subbasin
- Reclaimed water percolation
- Irrigation deep percolation
- Dispersed recharge from rainfall
- Bedrock inflow
- Percolation from streams
- Shallow discharge to streams
- Inflow from Other MAs

Outflows

- Outflow to Other MAs
- Subsurface outflow to Llagas Subbasin
- Wells - M&I and domestic
- Wells - agricultural
- Groundwater discharge to streams
- Riparian evapotranspiration
- Cumulative Storage Change

Data:
T:\Projects\San Benito GSP 37643\Model\GWV\ZBout.xlsx Run 54c

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TODD GROUNDWATER

Figure G-21 Simulated Annual Water Balances in the Bolsa MA

Path: T:\Projects\San Benito GSP 37643\GRAPHICS\SanBenitoGSP\Figure G-21 Simulated Annual Water Balances in the Bolsa MA.gpj

APPENDIX H

Dedicated Monitoring Well Program Report

June 29, 2021

TECHNICAL MEMORANDUM

To: Jeff Cattaneo, San Benito County Water District

From: Amber Ritchie, PG, CHG
Arden Wells, GIT
Chad Taylor, PG, CHG

Re: Identification of Dedicated Monitoring Well Sites, North San Benito Basin

Additional collection of hydrogeologic data and new dedicated monitoring wells are needed for Groundwater Sustainability Plan (GSP) preparation. This reflects the fact that the new North San Benito Basin (Basin) has a greater extent than previously monitored areas, especially in the Southern Management Area. In addition, specific data gaps and uncertainties have been identified during preparation of GSP chapters. Objectives for siting new dedicated monitoring wells are to fill gaps in the existing monitoring network and provide a groundwater monitoring framework to support GSP implementation.

APPROACH

Achieving these objectives has required detailed analysis, including development and implementation of a geographically-based index overlay methodology. This indexed overlay method has included development of geographic information system (GIS) datasets and subsequent mapping of these datasets together to find locations that fill multiple data gaps. The areas where new monitoring wells are needed were identified and classified with feedback from San Benito County Water District (SBCWD) staff based on existing monitored well locations, data gaps identified in the GSP, the hydrogeologic conceptual model, and other factors. This process identified and delineated areas where new wells should be located and prioritized them into two categories (Priority A and Priority B). These areas were then combined with Assessor's Parcel maps to identify properties and property owners to contact regarding new monitoring well installation access agreements. This Technical Memorandum summarizes the preliminary siting of six deep monitoring wells and six shallow wells (for monitoring surface water-groundwater interactions).

DEEP MONITORING WELLS

Siting for new dedicated deep monitoring wells involved the following steps:

Identification of Existing Wells in Groundwater Level Monitoring Program

A preliminary step involved identifying wells recently used for water level monitoring, and then delineating regions with and without well coverage. A query of the SBCWD water level database identified 100 wells in the San Benito Basin with measurements in 2018 and 2019. In 2019 and 2020, additional existing wells were identified for incorporation into the SBCWD groundwater level monitoring program. **Figure 1** shows these wells, along with the identified disadvantaged community (DAC) and severely disadvantaged community (SDAC) areas within Basin and the location of the Hollister Test Well installed in January 2021 that also will be used for monitoring.

Review of Existing Water Quality Monitoring Wells

Twenty-two wells in the North San Benito Basin are regularly sampled by SBCWD for water quality but do not have recent water level measurements. Six of these wells (highlighted on Figure 1) are in areas with a low density of water level monitoring wells. These six wells and the other water quality monitoring wells should be added to the water level monitoring network.

Delineation of Search Areas for Siting New Deep Monitoring Wells

To delineate areas with local water level monitoring, a one-mile radius was defined around each existing monitoring well. Most of the North San Benito Basin is within one mile of an existing monitoring well. As shown in **Figure 2**, eleven areas beyond one mile from a monitoring well were identified as Search Areas for new well sites. Also shown on **Figure 2** are upland areas with steep topography, semi-consolidated geologic materials, and potential for groundwater production. These were excluded from Search Areas because these areas contain few to no wells. In addition, groundwater levels are largely dependent on ground surface elevation and these areas are too rugged for meaningful monitoring. The remaining areas were categorized as Priority A (highest priority) and Priority B (lower priority). Areas on basin margins were assigned lower priority as groundwater levels may not be reliable indicators of basin conditions.

The Search Areas were numbered, and parcels within each Search Area were identified and listed.

New Monitoring Well Site Selection

SBCWD led the site selection effort and handled all coordination with property owners. They first attempted to contact each of the property owners within the Search Areas through a combination of mailed correspondence, phone calls, and field canvassing. This process focused on identifying drilling locations with landowners open to access agreements, and physical accessibility for drilling equipment and future monitoring.

The initial site selection efforts led by SBCWD identified multiple property owners open to allowing the construction of new wells. These were reviewed and refined to find the

locations best suited to new monitoring well construction, which resulted in the six deep dedicated monitoring well locations shown on **Figure 2**. As shown, each was assigned a unique well name identifier as follows: NSBDW-X (North San Benito Deep Well) with X as the well number 1 through 6, numbered in a general west to east direction across the basin. The six deep planned monitoring wells are identified below.

- ***North San Benito Deep Well 1 (NSBDW-1)*** This drilling site is located on Frazier Lake Road west of Highway 25 and Hollister. It is located on the northwest corner of APN 018-010-009-000.
- ***North San Benito Deep Well 2 (NSBDW-2)*** The drilling site is located on Highway 25 just southeast of the intersection with Highway 156, northwest of Hollister. It is located on the northern edge of APN 014-800-050-000.
- ***North San Benito Deep Well 3 (NSBDW-3)*** This drilling site is located on the northeastern edge of APN 019-600-006-000, east of Aubrey Lane, off McCloskey Road, north of Hollister.
- ***North San Benito Deep Well 4 (NSBDW-4)*** The drilling site is located on the northern edge of APN 017-180-005-000, just east of Fairview Road in northeast Hollister.
- ***North San Benito Deep Well 5 (NSBDW-5)*** The drilling site is located south of Murphy Road on the western edge of APN 026-080-044-000 in Paicines.
- ***North San Benito Deep Well 6 (NSBDW-6)*** The drilling site is located west of Highway 25 off Live Oak Road in Paicines, just east of the stream on APN 027-080-057-000.

Deep Well Construction

To determine preliminary drilling depth and well construction estimates for each deep monitoring well, nearby wells were identified and available well logs were reviewed. The well depth and screen interval information from these wells was tabulated and reviewed to define a preliminary well depth and screen length for the respective deep monitoring well. Key well design objectives for the monitoring wells are to drill as deep or deeper than existing nearby wells to account for possible future water level declines and to have representative well screen length and placement to appropriately track local groundwater level changes.

The six deep wells will be drilled using mud rotary methods. Each will be drilled with a 10-inch borehole to accommodate a 4-inch diameter monitoring well. The wells will be constructed with Schedule 80 PVC casing and Schedule 80 PVC 0.040-inch slotted PVC screen. No. 3 sand filter pack and a bentonite transition seal and a neat cement seal will be placed in each well. Surface completions will consist of an above ground concrete pad and protective stovepipe cover with locking cap. The table below summarizes the preliminary construction of the six deep groundwater monitoring wells. Construction of the wells may be altered depending on materials or conditions encountered in the field.

Table 1. Preliminary Deep Monitoring Well Depths and Construction

Well Name	NSBDW-1	NSBDW-2	NSBDW-3	NSBDW-4	NSBDW-5	NSBDW-6
Borehole Depth (feet bgs)	800	700	500	500	500	300
Blank Casing Intervals (feet bgs)	0 to 490, 790 to 800	0 to 440, 690 to 700	0 to 290, 490 to 500	0 to 290, 490 to 500	0 to 290, 490 to 500	0 to 190, 290 to 300
Screen Interval (feet bgs)	490 to 790	440 to 690	290 to 490	290 to 490	290 to 490	190 to 290
Filter Pack Interval (feet bgs)	210 to 800	210 to 700	210 to 500	210 to 500	210 to 500	150 to 300
Bentonite Seal Interval (feet bgs)	200 to 210	200 to 210	200 to 210	200 to 210	200 to 210	140 to 150
Cement Seal Interval (feet bgs)	0 to 200	0 to 200	0 to 200	0 to 200	0 to 200	0 to 140

SHALLOW MONITORING WATER WELLS

Preliminary siting of new dedicated shallow monitoring wells involved the following steps:

Designation of Key Wells for Monitoring Interconnected Surface Water and Groundwater

Nineteen existing wells have been identified to serve as Key Wells for evaluating and tracking groundwater/surface water interactions relative to defined Minimum Thresholds (see GSP Section 6). These wells are located within one mile of a stream reach where springtime depth to water is typically 20 feet or less and the well is not separated from the stream reach by a fault. **Figure 3** shows the identified stream reaches where groundwater/surface water interactions are likely to occur and the associated Key Well locations.

Identification of Sites for New Shallow Monitoring Wells

While providing best available information, the currently-selected key wells are all water supply wells with relatively deep screens that do not provide adequate vertical coverage. Accordingly, six sites have been selected for installation of new dedicated shallow wells (**Figure 3**). The rationale for selecting these sites includes location close to stream reaches with shallow groundwater and distribution among the major streams (Pajaro River, Pacheco Creek, San Benito River, and Tres Pinos Creek) with in-stream or riparian habitat. Field canvassing along the identified stream reaches was completed in order to identify drilling locations based on landowner agreement, drill rig access, and accessibility for future monitoring.

As with the deep wells, each of the six shallow wells was assigned a unique identifier, as follows: NSBSW-X (North San Benito Shallow Well) with X as the well number 1 through 6, numbered in a general west to east direction across the basin. The six shallow planned monitoring wells are identified below.

- ***North San Benito Shallow Well 1 (NSBSW-1)*** This site is on the eastern stretch of the unmonitored stretch of the Pajaro River in the triangular plot of land bounded by the river, Highway 25, and the railroad track. The site can be accessed via Highway 25 directly to the south. The well will be in the southwest corner of APN 013-030-032-000.
- ***North San Benito Shallow Well 2 (NSBSW-2)*** This site is located on the northern bank of the Pacheco Creek just southwest of the intersection of San Felipe Rd and Dunne St. The site can be accessed by San Felipe Rd and is located near the eastern edge of APN 015-020-018-000.
- ***North San Benito Shallow Well 3 (NSBSW-3)*** The site is located at the northern terminus of Lucy Brown Lane on the southern bank of the San Benito River. The well will be on the western edge of Lucy Brown Lane in the northeast corner of APN 018-070-001-000.
- ***North San Benito Shallow Well 4 (NSBSW-4)*** This drilling site is located on the plot of land just southwest of the intersection of Hospital Road and Truckee Way on the northern bank of the San Benito River. The site can be accessed via Hospital Road and is located on the southeastern edge of APN 021-110-001-000.
- ***North San Benito Shallow Well 5 (NSBSW-5)*** This drilling site is located on the northern bank of the Tres Pinos Creek in the vegetated area just south of an agricultural field. The site can be accessed via the unnamed private farm road to the northwest. The site is located on the northern edge of APN 022-160-038-000.
- ***North San Benito Shallow Well 6 (NSBSW-6)*** This drilling site is located on the upper end of the northern bank of the Paicines Creek and can be accessed via the unnamed private farm road from the north. The site is located on the western edge of APN 023-100-041-000.

Shallow Well Construction

The shallow monitoring wells will be drilled to a depth of between 50 and 60 feet, dependent upon local groundwater levels. Preliminary well design should account for seasonal variations in shallow groundwater near each stream reach.

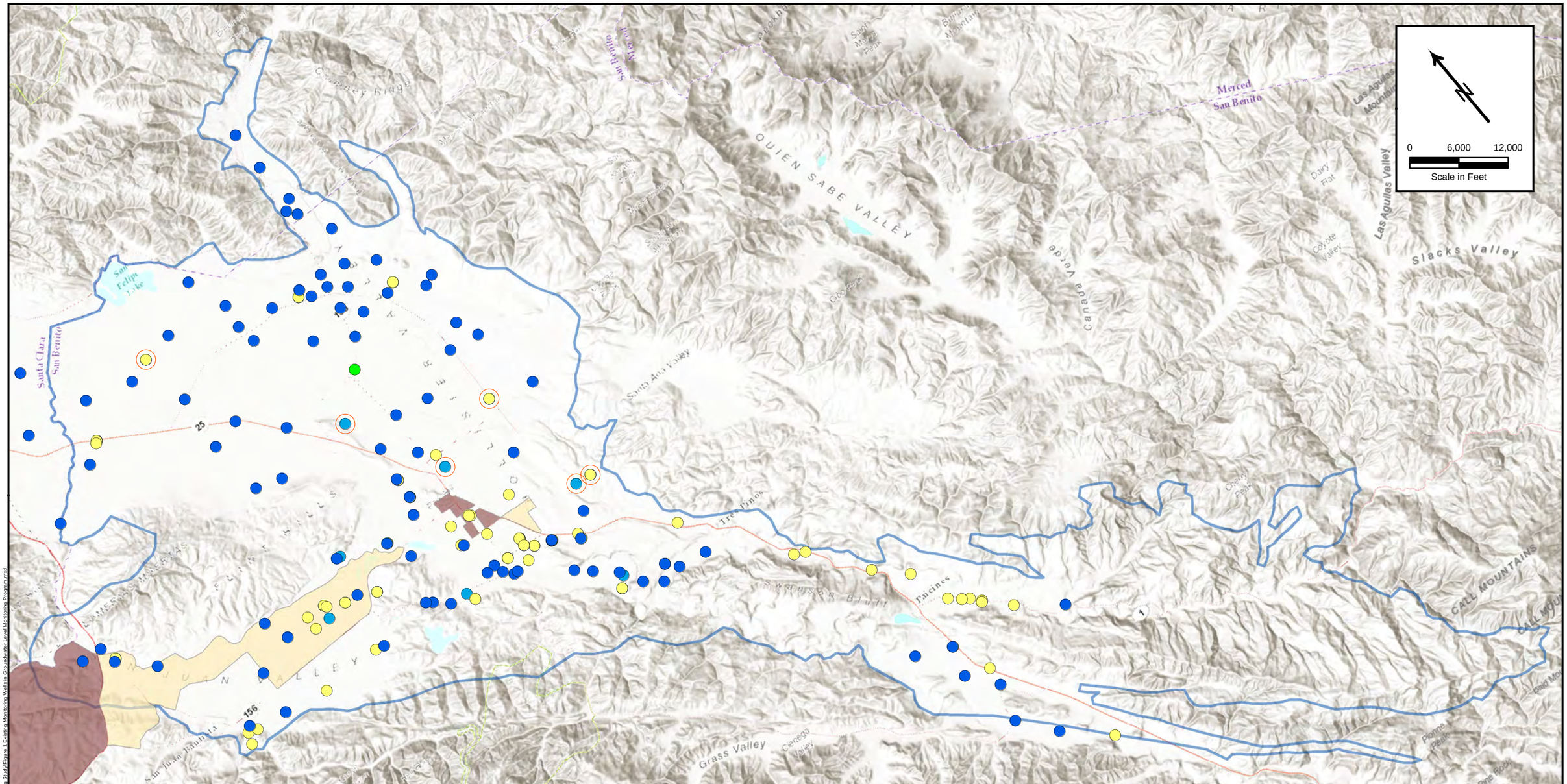
The six shallow wells will be drilled with by hollow stem auger methods. Each will be drilled with an 8-inch borehole to accommodate a 2-inch diameter monitoring well. The wells will be constructed with Schedule 40 PVC casing and Schedule 40 PVC 0.040-inch slotted PVC screen. No. 3 sand filter pack and a bentonite transition seal will be installed. All wells will have a neat cement seal and surface completion will consist of an above ground concrete pad and stovepipe with locking cap. The table below summarizes the preliminary construction of the six shallow groundwater monitoring wells. Construction of the wells may

be altered depending on materials encountered in the field or groundwater levels following drilling.

Table 2. Preliminary Shallow Monitoring Well Depths and Construction

Well Name	NSBSW-1	NSBSW-2	NSBSW-3	NSBSW-4	NSBSW-5	NSBSW-6
Borehole Depth (feet bgs)	50	50	50	50	60	60
Blank Casing Intervals (feet bgs)	0 to 15	0 to 15	0 to 15	0 to 15	0 to 15	0 to 15
Screen Interval (feet bgs)	15 to 50	15 to 50	15 to 50	15 to 50	15 to 60	15 to 60
Filter Pack Interval (feet bgs)	12 to 50	12 to 50	12 to 50	12 to 50	12 to 60	12 to 60
Bentonite Seal Interval (feet bgs)	10 to 12	10 to 12	10 to 12	10 to 12	10 to 12	10 to 12
Cement Seal Interval (feet bgs)	0 to 10	0 to 10	0 to 10	0 to 10	0 to 10	0 to 10

We appreciate the District's efforts in gaining landowner permission and access to the recommended sites and look forward to initiation of the field program. Please do not hesitate to call or email if you have questions or comments.

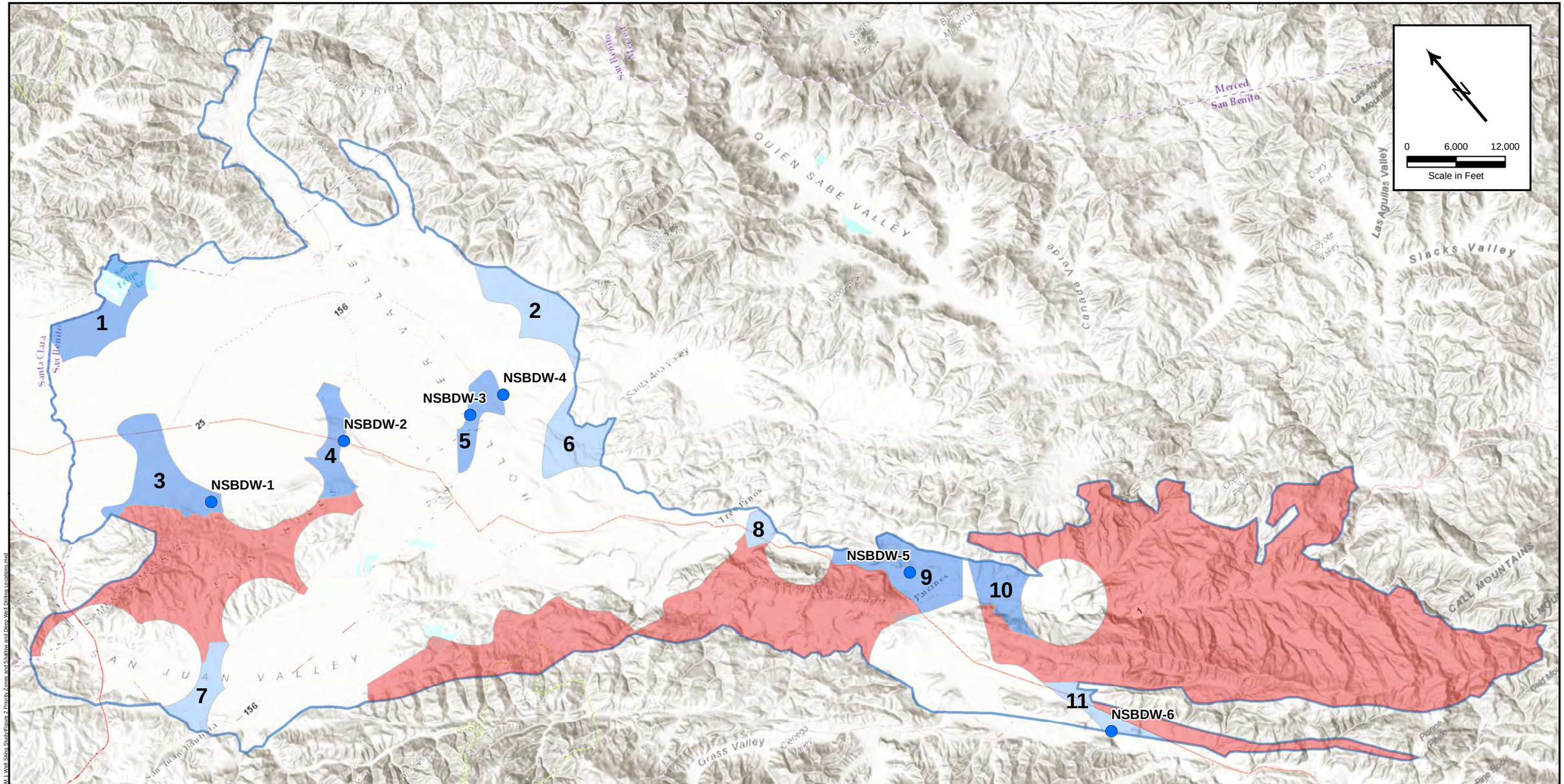


- Wells with Water Level Measurements in 2018 and 2019
- Water Quality Monitoring Wells
- Water Quality Well Recommended for Water Level Monitoring
- Water Level Monitoring Wells Added in 2019 and 2020
- Hollister Test Well
- Disadvantaged Community
- Severely Disadvantaged Community
- North San Benito Basin

June 2021

TODD GROUNDWATER

Figure 1
Existing Groundwater Level Monitoring Program Wells

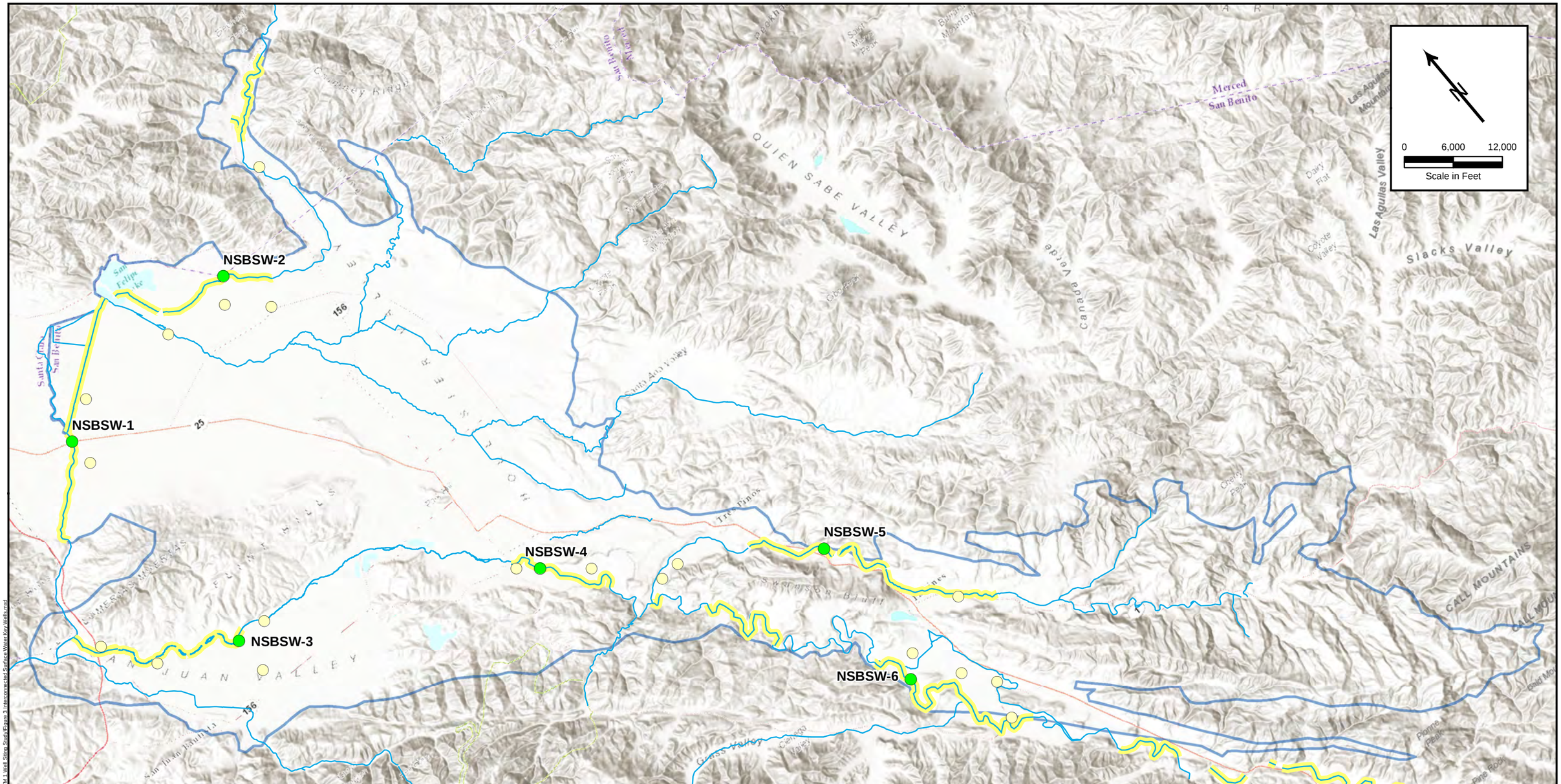


- New Deep Well Location
- Priority A Search Area
- Priority B Search Area
- Areas with Few to No Wells
- North San Benito Basin

April 2021

TODD GROUNDWATER

Figure 2
Priority Zones and Shallow and Deep Well Drilling Locations



New Shallow Well Location

Existing Interconnected Surface Water Key Well

Stream Reach Potentially Connected to Groundwater

North San Benito Basin

April 2021

TODD GROUNDWATER

Figure 3
Interconnected Surface Water and Monitoring Wells

APPENDIX I

List of Public Meetings and Comments on the Plan

Table I-1. List of Public Meetings for each GSA

GSA	Date	Type	Major Subject
SBCWD	8/15/2018	TAC Meeting	Orientation and SGMA Overview
SBCWD	11/7/2018	TAC Meeting	Plan Area, Sustainability, Data
SBCWD	1/14/2019	TAC Meeting	Data Memo, Sustainability, Outreach
SBCWD	4/24/2019	TAC Meeting	HCM, Groundwater Conditions, Management Areas
SBCWD	8/28/2019	TAC Meeting	Management Areas, Sustainability Criteria
SBCWD	10/30/2019	TAC Meeting	Water Budget, Sustainability Goal
SBCWD	1/13/2020	TAC Meeting	Water Budget, Model, Water Quality
SBCWD	2/24/2020	TAC Meeting	Water Quality Sustainability
SBCWD	4/29/2020	TAC Meeting	Groundwater Levels Sustainability
SBCWD	7/22/2020	TAC Meeting	Levels and Storage Sustainability
SBCWD	8/26/2020	TAC Meeting	Subsidence and Interconnected Surface Water Sustainability
SBCWD	9/29/2020	TAC Meeting	Monitoring, Measuring Extraction
SBCWD	11/4/2020	TAC Meeting	Measuring Groundwater Extraction
SBCWD	1/27/2021	TAC Meeting	Measuring Extraction, GSP Funding
SBCWD	2/24/2021	TAC Meeting	Monitoring, Managed Aquifer Recharge, Projects and Management Actions
SBCWD	4/28/2021	TAC Meeting	Future Scenarios, Projects and Management Actions, Implementation
SBCWD	6/30/2021	TAC Meeting	GSP Overview
SBCWD	11/14/2018	Public Workshop	Sustainable Groundwater Management Act
SBCWD	6/18/2019	Public Workshop	Hydrogeological Conceptual Model (HCM)/ Groundwater Conditions
SBCWD	9/23/2020	Public Workshop	Water Budget/ Sustainability Management Criteria
SBCWD	12/9/2020	Public Workshop	Overview of GSP for Governance Council
SBCWD	3/10/2021	Public Workshop	Sustainability Management Criteria/ Monitoring/ Management Actions
SBCWD	8/4/2021	Public Workshop	Overview of GSP
SBCWD	4/24/2019	SBCWD GSA Board Presentation	Update, HCM, Groundwater Conditions
SBCWD	8/28/2019	SBCWD GSA Board Presentation	Management Areas, Budget, Sustainability
SBCWD	10/30/2019	SBCWD GSA Board Presentation	Water Budgets
SBCWD	7/29/2020	SBCWD GSA Board Presentation	Levels and Storage Sustainability Criteria
SBCWD	12/16/2020	SBCWD GSA Board Presentation	Monitoring for Sustainability
SBCWD	6/30/2021	SBCWD GSA Board Presentation	GSP Overview
SBCWD	7/14/2021	SBCWD GSA Board Presentation	Fees
SBCWD	7/28/2021	SBCWD GSA Board Presentation	Next Steps for GSP
SBCWD	11/17/2021	SBCWD GSA Board Presentation and Adoption Hearing	Adoption

SBCWD	10/24/2018	Pajaro Compass, A Network for Voluntary Conservation	Introduction to SBCWD GSP Process
SBCWD	7/24/2019	Governance Committee of San Benito County	SGMA and GSP Overview
SBCWD	1/4/2021	Annual Report WY 2020 Special Hearing	GSP Update
SBCWD	1/6/2020	Annual Report WY 2019 Special Hearing	Update, Water Budget
SBCWD	1/7/2019	Annual Report WY 2018 Special Hearing	SGMA Overview and GSP Update
Valley Water	2/14/2017	Valley Water Board of Directors Meeting	Sustainable Groundwater Management Act Compliance for Groundwater Basins Overlapping with San Benito County.
Valley Water	5/9/2017	Valley Water Board of Directors Meeting	Resolution Setting Time and Date of Public Hearing to Become the Groundwater Sustainability Agency for the Portions of the Hollister and San Juan Bautista Subbasins Located in Santa Clara County.
Valley Water	6/13/2017	Valley Water Board of Directors Meeting	Public Hearing and Resolution to Become the Groundwater Sustainability Agency for the Portions of the Hollister and San Juan Bautista Subbasins Located within Santa Clara County.
Valley Water	1/8/2018	Valley Water Board's Agricultural Water Advisory Committee	Sustainable Groundwater Management Act (SGMA) Update – SGMA Authority Implementation Framework Concepts (Vanessa De La Piedra)
Valley Water	9/4/2019	Valley Water Board's Joint Water Resources Committee (City of Gilroy, City of Morgan Hill, and Valley Water)	Sustainable Groundwater Management Act (SGMA) Update
Valley Water	8/30/2021	Valley Water Board's Water Conservation and Demand Management Committee	Sustainable Groundwater Management Act (SGMA) Verbal Update
Valley Water	5/10/2021	Valley Water Board's Water Conservation and Demand Management Committee	Sustainable Groundwater Management Act (SGMA) Update
Valley Water	12/14/2021	Valley Water GSA Board Presentation and Adoption Hearing	Adoption

October 27, 2021

San Benito County Water District
30 Mansfield Road
Hollister, CA 95023

Submitted via web: https://www.sbcwd.com/gsp-development/

Re: Public Comment Letter for North San Benito Basin Draft GSP

Dear Jeff Cattaneo,

On behalf of the above-listed organizations, we appreciate the opportunity to comment on the Draft Groundwater Sustainability Plan (GSP) for the North San Benito Basin being prepared under the Sustainable Groundwater Management Act (SGMA). Our organizations are deeply engaged in and committed to the successful implementation of SGMA because we understand that groundwater is critical for the resilience of California's water portfolio, particularly in light of changing climate. Under the requirements of SGMA, Groundwater Sustainability Agencies (GSAs) must consider the interests of all beneficial uses and users of groundwater, such as domestic well owners, environmental users, surface water users, federal government, California Native American tribes and disadvantaged communities (Water Code 10723.2).

As stakeholder representatives for beneficial users of groundwater, our GSP review focuses on how well disadvantaged communities, drinking water users, tribes, climate change, and the environment were addressed in the GSP. While we appreciate that some basins have consulted us directly via focus groups, workshops, and working groups, we are providing public comment letters to all GSAs as a means to engage in the development of 2022 GSPs across the state. Recognizing that GSPs are complicated and resource intensive to develop, the intention of this letter is to provide constructive stakeholder feedback that can improve the GSP prior to submission to the State.

Based on our review, we have significant concerns regarding the treatment of key beneficial users in the Draft GSP and consider the GSP to be **insufficient** under SGMA. We highlight the following findings:

1. Beneficial uses and users **are not sufficiently** considered in GSP development.
    a. Human Right to Water considerations **are not sufficiently** incorporated.
    b. Public trust resources **are not sufficiently** considered.
    c. Impacts of Minimum Thresholds, Measurable Objectives and Undesirable Results on beneficial uses and users **are not sufficiently** analyzed.

2. Climate change **is not sufficiently** considered.
3. Data gaps **are not sufficiently** identified and the GSP **does not have a plan** to eliminate them.
4. Projects and Management Actions **do not sufficiently consider** potential impacts or benefits to beneficial uses and users.

Our specific comments related to the deficiencies of the North San Benito Basin Draft GSP along with recommendations on how to reconcile them, are provided in detail in **Attachment A.**

Please refer to the enclosed list of attachments for additional technical recommendations:

Attachment A	GSP Specific Comments
Attachment B	SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users
Attachment C	Freshwater species located in the basin
Attachment D	The Nature Conservancy's "Identifying GDEs under SGMA: Best Practices for using the NC Dataset"

Thank you for fully considering our comments as you finalize your GSP.

Best Regards,

Ngodoo Atume
Water Policy Analyst
Clean Water Action/Clean Water Fund

J. Pablo Ortiz-Partida, Ph.D.
Western States Climate and Water Scientist
Union of Concerned Scientists

Samantha Arthur
Working Lands Program Director
Audubon California

Danielle V. Dolan
Water Program Director
Local Government Commission

E.J. Remson
Senior Project Director, California Water Program
The Nature Conservancy

Melissa M. Rohde
Groundwater Scientist
The Nature Conservancy

Attachment A

Specific Comments on the North San Benito Basin Draft Groundwater Sustainability Plan

1. Consideration of Beneficial Uses and Users in GSP development

Consideration of beneficial uses and users in GSP development is contingent upon adequate identification and engagement of the appropriate stakeholders. The (A) identification, (B) engagement, and (C) consideration of disadvantaged communities, drinking water users, tribes,[1] groundwater dependent ecosystems, streams, wetlands, and freshwater species are essential for ensuring the GSP integrates existing state policies on the Human Right to Water and the Public Trust Doctrine.

A. Identification of Key Beneficial Uses and Users

Disadvantaged Communities and Drinking Water Users

The identification of Disadvantaged Communities (DACs) and drinking water users is **insufficient**. The GSP provides information about DACs, including identification by name and location on a map. However, it was unclear whether DACs were identified by using US Census places, tracts, or block group data. The GSP fails to document the population of each DAC, and fails to include the population dependent on groundwater as their source of drinking water in the basin.

While the plan provides a density map of domestic wells in the basin, the GSP fails to provide depth of these wells (such as minimum well depth, average well depth, or depth range) within the basin.

These missing elements are required for the GSA to fully understand the specific interests and water demands of these beneficial users, and to support the consideration of beneficial users in the development of sustainable management criteria and selection of projects and management actions.

RECOMMENDATIONS
• Indicate the level of geographic boundaries for DACs (i.e., US Census places, tracts, or block groups). • Describe the population of each identified DAC. • Identify the sources of drinking water for DAC members, including an estimate of how many people rely on groundwater (e.g., domestic wells, state small water systems, and public water systems).

[1] Our letter provides a review of the identification and consideration of federally recognized tribes (Data source: SGMA Data viewer) within the GSP from non-tribal members and NGOs. Based on the likely incomplete information available to our organizations for this review, we recommend that the GSA utilize the California Department of Water Resources' "Engagement with Tribal Governments" Guidance Document (https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents) to comprehensively address these important beneficial users in their GSP.

- Include a map showing domestic well locations and average well depth across the basin.

Interconnected Surface Waters

The identification of Interconnected Surface Waters (ISWs) is **insufficient**, due to lack of supporting information provided for the ISW analysis. The GSP describes the use of streamflow measurements from the late 1990s and early 2000s to identify the pattern of gaining and losing reaches in the basin. The GSP also describes available depth-to-groundwater data, but provides the caveat (p. 4-18): *"However, available data are of limited use for this purpose due to insufficient geographic and vertical coverage. Available data are almost entirely from water supply wells, which are typically screened 200 to 500 feet below the ground surface. The groundwater elevation (potentiometric head) at the depth of the well screen can be different from the true water table, which is the first zone of saturation reached when drilling down from the ground surface."* The GSP presents contours of depth to groundwater in fall 2017, but contours from this single date are the only data presented.

The GSP presents conflicting conclusions for the ISW analysis. Figure 4-22 (Surface Water Connected to Groundwater) shows gaining and losing reaches in the basin, implying that all reaches in the basin are interconnected. However, Figure 6-6 (Depth to Water October 1992 and April 1998) shows a smaller subset of stream reaches labeled as potentially connected to groundwater. The latter figure is presented in Chapter 6 (Sustainable Management Criteria), not Section 4.11 (Interconnection of Surface Water and Groundwater).

RECOMMENDATIONS

- Provide a map showing all the stream reaches in the basin, with reaches clearly labeled as interconnected (gaining and losing) or disconnected. Present this map in Section 4.11 (Interconnection of Surface Water and Groundwater), not Chapter 6 (Sustainable Management Criteria). Consider any segments with data gaps as potential ISWs and clearly mark them as such on maps provided in the GSP.

- Provide depth-to-groundwater contour maps using the best practices presented in Attachment D, to aid in the determination of ISWs. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a digital elevation model (DEM) to estimate depth to groundwater contours across the landscape. This will provide accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.

- Use seasonal data over multiple water year types to capture the variability in environmental conditions inherent in California's climate, when mapping ISWs. We recommend the 10-year pre-SGMA baseline period of 2005 to 2015.

- Reconcile ISW data gaps with specific measures (shallow monitoring wells, stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP.

Groundwater Dependent Ecosystems

The identification of Groundwater Dependent Ecosystems (GDEs) is **insufficient**, due to a lack of comprehensive, systematic analysis of the basin's GDEs. The GSP provides general discussion of riparian vegetation and depth to groundwater. In addition, the GSP presents an empirical method for relating vegetation health to groundwater elevations in wells, comparing aerial photographs of phreatophytic riparian vegetation before and after droughts. The GSP states (p. 4-22): *"The general conclusion that can be drawn from the pre- and post-drought aerial photograph comparison is that riparian vegetation tends to persist even when groundwater elevations in nearby water supply wells are 35 to 40 feet below the ground surface for a period of two years."* No shallow groundwater data was used to verify the NC dataset polygons, however. The GSP does not provide an overall map of the basin's GDEs illustrating the conclusions of the GDE analysis.

RECOMMENDATIONS

- Develop and describe a systematic approach for analyzing the basin's GDEs. For example, provide a map of the NC Dataset. On the map, label polygons retained or removed from the NC dataset (and the removal reason if polygons are not considered potential GDEs). Discuss how local groundwater data was used to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer. Refer to Attachment D of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer.

- Use depth-to-groundwater data from multiple seasons and water year types (e.g., wet, dry, average, drought) to determine the range of depth to groundwater around NC dataset polygons. We recommend that a baseline period (10 years from 2005 to 2015) be established to characterize groundwater conditions over multiple water year types. Refer to Attachment D of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer.

- Provide depth-to-groundwater contour maps, noting the best practices presented in Attachment D. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a DEM to estimate depth-to-groundwater contours across the landscape.

- If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons as "Potential GDEs" in the GSP until data gaps are reconciled in the monitoring network.

- Provide a complete inventory, map, or description of fauna (e.g., birds, fish, amphibian) and flora (e.g., plants) species in the basin and note any threatened or endangered species (see Attachment C in this letter for a list of freshwater species located in the North San Benito Basin). The GSP text discusses plant and animal species dependent on groundwater, but does not provide a complete inventory in tabular form.

Native Vegetation and Managed Wetlands
Native vegetation and managed wetlands are water use sectors that are required to be included in the water budget.[2,3] The integration of these ecosystems into the water budget is **insufficient**. The water budget did explicitly include the current, historical, and projected demands of native vegetation, but did not explicitly include the current, historical, and projected demands of managed wetlands. The GSP discusses managed wetlands, the Pajaro River Wetland Mitigation Bank, on p. 2-5 of the GSP. The omission of explicit water demands for managed wetlands is problematic because key environmental uses of groundwater are not being accounted for as water supply decisions are made using this budget, nor will they likely be considered in project and management actions.

RECOMMENDATION
• Quantify and present all water use sector demands in the historical, current, and projected water budgets with individual line items for each water use sector, including managed wetlands.

B. Engaging Stakeholders

Stakeholder Engagement during GSP development
Stakeholder engagement during GSP development is **insufficient**. SGMA's requirement for public notice and engagement of stakeholders is not fully met by the description in the Communication Plan (Appendix D).[4]

We note the following deficiencies with the overall stakeholder engagement process:

- The opportunities for public involvement and engagement with DACs are described in general terms. They include participation through a Technical Advisory Committee, scheduled meetings, updates to the Water District website, and public workshops. Preliminary ideas for engaging DACs are described, including using "food, faith, and festivals" as opportunities to educate and interact with San Benito County Water District's Spanish speaking community on critical issues, connecting with communities through existing organizations, community events, churches, and schools, and developing bilingual materials. However, it is not clear if these strategies have been implemented.

- Organizations that represent environmental uses of groundwater are mentioned in the GSP, but specific outreach targeted to these groups is not described.

- The Communication Plan does not include a plan for continual opportunities for engagement through the implementation phase of the GSP for DACs, domestic well owners, and environmental stakeholders.

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[2] "'Water use sector' refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation." [23 CCR §351(al)]
[3] "The water budget shall quantify the following, either through direct measurements or estimates based on data: (3) Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow." [23 CCR §354.18]
[4] "A communication section of the Plan shall include a requirement that the GSP identify how it encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin." [23 CCR §354.10(d)(3)]

RECOMMENDATION

- In the Communication Plan, describe active and targeted outreach to engage DAC members, domestic well owners, and environmental stakeholders throughout the GSP development and implementation phases. Refer to Attachment B for specific recommendations on how to actively engage stakeholders during all phases of the GSP process.
- Utilize DWR's tribal engagement guidance to comprehensively address all tribes and tribal interests in the basin within the GSP.[5]

C. Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on Beneficial Uses and Users

The consideration of beneficial uses and users when establishing sustainable management criteria (SMC) is **insufficient**. The consideration of potential impacts on all beneficial users of groundwater in the basin are required when defining undesirable results and establishing minimum thresholds.[6,7,8]

Disadvantaged Communities and Drinking Water Users

For chronic lowering of groundwater levels, minimum thresholds are initially set at historical groundwater level lows and then adjusted upward to be more protective. The GSP acknowledges the impact of minimum thresholds on DACs, by stating justification of the minimum threshold levels as (p. 6-8): *"Upward adjustment to be protective in the San Juan Economically Disadvantaged Area."* The GSP does not state what the impacts of the minimum thresholds to DACs and drinking water users would be, however, when describing undesirable results.

The GSP recognizes that domestic wells could be impacted by groundwater management in the basin. The GSP states (p. 6-6): *"In North San Benito, some concern exists that some recent wells might be relatively shallow because they were constructed during a period when groundwater levels have been maintained at relatively high levels."* The GSP does not attempt to quantify this impact, however. Thus, the GSP does not sufficiently analyze direct and indirect impacts on drinking water users when defining undesirable results, or evaluate the cumulative or indirect impacts of proposed minimum thresholds on drinking water users.

The GSP identifies the constituents of concern (COCs) in the basin for which SMC have been established as total dissolved solids (TDS) and nitrate. Other potential COCs in the basin include perchlorate, selenium, hardness, boron, iron, manganese, arsenic, and chromium. The GSP states (p. 6-28): *"Sustainable criteria have not been developed in this GSP for these constituents*

[5] Engagement with Tribal Governments Guidance Document. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Guidance-Doc-for-SGM-Engagement-with-Tribal-Govt_ay_19.pdf

[6] "The description of undesirable results shall include [...] potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results." [23 CCR §354.26(b)(3)]

[7] "The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]

[8] "The description of minimum thresholds shall include [...] how state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the agency shall explain the nature of and the basis for the difference." [23 CCR §354.28(b)(5)]

because they are already managed under existing programs or because they are naturally occurring and unlikely to be affected by GSP management actions." However, SMC should be established for all COCs in the basin that may be impacted and/or exacerbated by groundwater use or management, in addition to coordinating with water quality regulatory programs. Naturally occurring COCs can be exacerbated as a result of groundwater use or groundwater management within the basin.

RECOMMENDATIONS

Chronic Lowering of Groundwater Levels

- Describe direct and indirect impacts on DACs and drinking water users when describing undesirable results for chronic lowering of groundwater levels.
- Consider and evaluate the impacts of selected minimum thresholds and measurable objectives on DACs and drinking water users within the basin. Further describe the impact of passing the minimum threshold for these users. For example, provide the number of domestic wells that would be de-watered at the minimum threshold.

Degraded Water Quality

- Describe direct and indirect impacts on DACs and drinking water users when defining undesirable results for degraded water quality. For specific guidance on how to consider these users, refer to "Guide to Protecting Water Quality Under the Sustainable Groundwater Management Act."[9]
- Evaluate the cumulative or indirect impacts of proposed minimum thresholds for degraded water quality on DACs and drinking water users.
- Set minimum thresholds and measurable objectives for water quality constituents within the basin, including naturally occurring constituents that can be exacerbated as a result of groundwater use or groundwater management. Ensure they align with drinking water standards.[10]

Groundwater Dependent Ecosystems and Interconnected Surface Waters

Sustainable management criteria for chronic lowering of groundwater levels provided in the GSP do not consider potential impacts to environmental beneficial users. The GSP neither describes nor analyzes direct or indirect impacts on environmental users of groundwater when defining undesirable results. This is problematic because without identifying potential impacts to GDEs, minimum thresholds may compromise, or even destroy, these environmental beneficial users. Since GDEs are present in the basin, they must be considered when developing SMC for chronic lowering of groundwater levels. Our comments above in the GDE section note that shallow groundwater data was not used to verify the NC dataset polygons, therefore the GSP may have disregarded some GDEs in the basin. After re-analyzing GDEs based on our comments above, consider potential impacts to GDEs for the chronic lowering of groundwater levels sustainability indicator.

[9] Guide to Protecting Water Quality under the Sustainable Groundwater Management Act https://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/293/attachments/original/1559328858/Guide_to_Protecting_Drinking_Water_Quality_Under_the_Sustainable_Groundwater_Management_Act.pdf?1559328858.

[10] "Degraded Water Quality [...] collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues." [23 CCR §354.34(c)(4)]

In the depletion of interconnected surface water SMC section of the GSP (Section 6.7), the GSP discusses impacts to beneficial users of groundwater and surface water. The GSP uses a water table depth of 20 feet as an estimate of the maximum depth accessed by riparian vegetation, citing typical rooting depths for some phreatophytes in the basin. However, valley oak (*Quercus lobata*) can access groundwater at depths as deep as 80 feet.[11,12] The GSP also does present some discussion of potential causes of undesirable results to GDEs, using aerial photos and measures of vegetative health (i.e., NDVI and NDMI). The GSP does not, however, state how this analysis helps to inform the development of SMC that are protective of terrestrial GDEs.

To establish SMC for depletion of interconnected surface water, the GSP sufficiently discusses impacts to aquatic GDEs. Section 6.7.2. Potential Causes of Undesirable Results presents a modeling analysis to determine the impacts of changes in regional groundwater pumping on passage opportunity for migrating fish. The GSP includes a description of potential impacts on instream habitats within ISWs when minimum thresholds in the subbasin are reached. The GSP states (p. 6-48): "*The minimum threshold is expected to protect beneficial uses of surface water for aquatic and riparian habitat maintenance. The few springs in the interior of the basin that could plausibly be affected by pumping (along Tequisquita Slough and San Juan Creek) are on the upgradient side of the Calaveras and San Andreas faults, where shallow water levels are relatively stable. Along stream reaches in red-legged frog habitat (San Benito River upstream of Bird Creek and Tres Pinos Creek between Tres Pinos Creek Valley and Southside Road), the lowest simulated water levels in the future baseline scenario were under 1992 conditions and were equal to or higher than historical water levels at that time.*"

RECOMMENDATIONS

- Analyze depth to water data and rooting depth data for GDEs in the GDE identification section of the GSP, in addition to the sustainable management criteria section. Refer to Attachment B for more information on TNC's plant rooting depth database. Deeper thresholds are necessary for plants that have reported maximum root depths that exceed the averaged 30-ft threshold, such as valley oak (*Quercus lobata*). We recommend that the reported max rooting depth for these deeper-rooted plants be used. For example, a depth-to-groundwater threshold of 80 feet should be used instead of the 30-ft threshold, when verifying whether valley oak polygons from the NC Dataset are connected to groundwater.

- When defining undesirable results for chronic lowering of groundwater levels, provide specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact to GDEs. Undesirable results to environmental users occur when 'significant and unreasonable' effects on beneficial users are caused by one of the sustainability indicators (i.e., chronic lowering of groundwater levels, degraded water quality, or depletion of interconnected surface water). Thus, potential impacts on environmental beneficial uses and users need to be considered when defining undesirable results in the basin.

[11] Lewis, D.C. and Burgy, R.H. 1964. The relationship between oak tree roots and groundwater in fractured rock as determined by tritium tracing. Journal of Geophysical Research, 69(12), pp.2579-2588.
[12] Howard, Janet L. 1992. Quercus lobata. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.fed.us/database/feis/plants/tree/quelob/all.html [2021, October 8].

Defining undesirable results is the crucial first step before the minimum thresholds can be determined.[13,14]

- When establishing SMC for the subbasin, consider that the SGMA statute [Water Code §10727.4(l)] specifically calls out that GSPs shall include "impacts on groundwater dependent ecosystems".

2. Climate Change

The SGMA statute identifies climate change as a significant threat to groundwater resources and one that must be examined and incorporated in the GSPs. The GSP Regulations require integration of climate change into the projected water budget to ensure that projects and management actions sufficiently account for the range of potential climate futures.[15] The effects of climate change will intensify the impacts of water stress on GDEs, making available shallow groundwater resources especially critical to their survival. Condon *et al.* (2020) shows that GDEs are more likely to succumb to water stress and rely more on groundwater during times of drought.[16] When shallow groundwater is unavailable, riparian forests can die off and key life processes (e.g., migration and spawning) for aquatic organisms, such as steelhead, can be impeded.

The integration of climate change into the projected water budget is **insufficient**. The GSP incorporates climate change into the projected water budget using DWR change factors for 2070. However, the plan does not consider multiple climate scenarios (e.g., the 2070 extremely wet and extremely dry climate scenarios) in the projected water budget. The GSP should clearly and transparently incorporate the extremely wet and dry scenarios provided by DWR into projected water budgets or select more appropriate extreme scenarios for the basin. While these extreme scenarios may have a lower likelihood of occurring, their consequences could be significant and their inclusion can help identify important vulnerabilities in the basin's approach to groundwater management.

The GSP includes climate change into key inputs (e.g., precipitation, evapotranspiration, and surface water flow) of the projected water budget. However, the sustainable yield is based on the projected water budget under baseline conditions. If the water budgets are incomplete, including the omission of extremely wet and dry scenarios, and sustainable yield is not calculated based on climate change projections, then there is increased uncertainty in virtually every subsequent calculation used to plan for projects, derive measurable objectives, and set minimum thresholds. Plans that do not adequately include climate change projections may underestimate future impacts on vulnerable beneficial users of groundwater such as ecosystems, DACs, and domestic well owners.

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[13] "The description of undesirable results shall include [...] potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results". [23 CCR §354.26(b)(3)]

[14] The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]

[15] "Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow." [23 CCR §354.18(e)]

[16] Condon et al. 2020. Evapotranspiration depletes groundwater under warming over the contiguous United States. Nature Communications. Available at: https://www.nature.com/articles/s41467-020-14688-0

RECOMMENDATIONS

- Integrate climate change, including extremely wet and dry scenarios, into all elements of the projected water budget to form the basis for development of sustainable management criteria and projects and management actions.
- Calculate sustainable yield based on the projected water budget with climate change incorporated.
- Incorporate climate change scenarios into projects and management actions.

3. Data Gaps

The consideration of beneficial users when establishing monitoring networks is **insufficient**, due to lack of specific plans to increase the Representative Monitoring Sites (RMSs) in the monitoring network that represent water quality conditions and shallow groundwater elevations around DACs and domestic wells.

Figure 7-1 (Groundwater Level Key Wells, Dedicated and Other Monitoring Wells) and Figure 7-4 (Wells in the SBCWD Water Quality Monitoring Program) show that no monitoring wells are located across portions of the basin near DACs and domestic wells. Beneficial users of groundwater may remain unprotected by the GSP without adequate monitoring and identification of data gaps in the shallow aquifer. The Plan therefore fails to meet SGMA's requirements for the monitoring network.[17]

The GSP provides discussion of data gaps for GDEs and ISWs, including proposed GDE-related biological monitoring, in Sections 6.7.7.1 (Discussion of Monitoring and Management Measures to be Implemented), Section 7.1.6 (Depletion of Interconnected Surface Water), and Section 8.10.2 (Project Implementation).

RECOMMENDATION

- Provide maps that overlay current and proposed monitoring well locations with the locations of DACs, domestic wells, GDEs, and ISWs to clearly identify potentially impacted areas. Increase the number of RMSs in the shallow aquifer across the basin as needed to adequately monitor all groundwater condition indicators. Prioritize proximity to DACs and domestic wells when identifying new RMSs.

4. Addressing Beneficial Users in Projects and Management Actions

The consideration of beneficial users when developing projects and management actions is **insufficient**, due to the failure to completely identify benefits or impacts of identified projects and management actions, including water quality impacts, to key beneficial users of groundwater such as GDEs, aquatic habitats, surface water users, DACs, and drinking water users. Therefore, potential project and management actions may not protect these beneficial users. Groundwater sustainability under SGMA is defined not just by sustainable yield, but by the avoidance of undesirable results for *all* beneficial users.

[17] "The monitoring network objectives shall be implemented to accomplish the following: [...] (2) Monitor impacts to the beneficial uses or users of groundwater." [23 CCR §354.34(b)(2)]

RECOMMENDATIONS

- For DACs and domestic well owners, include a drinking water well impact mitigation program to proactively monitor and protect drinking water wells through GSP implementation. Refer to Attachment B for specific recommendations on how to implement a drinking water well mitigation program.

- For DACs and domestic well owners, include a discussion of whether potential impacts to water quality from projects and management actions could occur and how the GSA plans to mitigate such impacts.

- The GSP discusses potential options for additional surface water storage. Note that recharge ponds, reservoirs, and facilities for managed aquifer recharge can be designed as multiple-benefit projects to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. For guidance on how to integrate multi-benefit recharge projects into your GSP, refer to the "Multi-Benefit Recharge Project Methodology Guidance Document."[18]

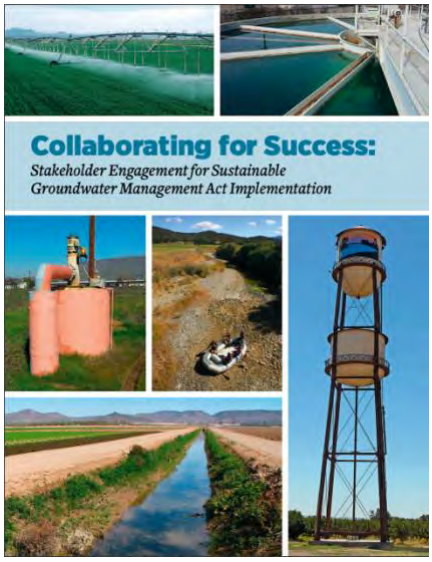
- Develop management actions that incorporate climate and water delivery uncertainties to address future water demand and prevent future undesirable results.

[18] The Nature Conservancy. 2021. Multi-Benefit Recharge Project Methodology for Inclusion in Groundwater Sustainability Plans. Sacramento. Available at: https://groundwaterresourcehub.org/sgma-tools/multi-benefit-recharge-project-methodology-guidance/

Attachment B

SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users

Stakeholder Engagement and Outreach



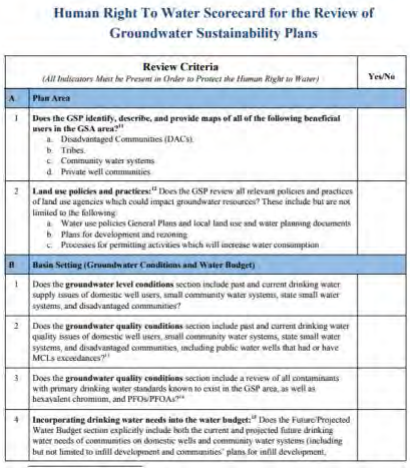
Clean Water Action, Community Water Center and Union of Concerned Scientists developed a guidance document called Collaborating for success: Stakeholder engagement for Sustainable Groundwater Management Act Implementation. It provides details on how to conduct targeted and broad outreach and engagement during Groundwater Sustainability Plan (GSP) development and implementation. Conducting a targeted outreach involves:

- Developing a robust Stakeholder Communication and Engagement plan that includes outreach at frequented locations (schools, farmers markets, religious settings, events) across the plan area to increase the involvement and participation of disadvantaged communities, drinking water users and the environmental stakeholders.

- Providing translation services during meetings and technical assistance to enable easy participation for non-English speaking stakeholders.

- GSP should adequately describe the process for requesting input from beneficial users and provide details on how input is incorporated into the GSP.

The Human Right to Water

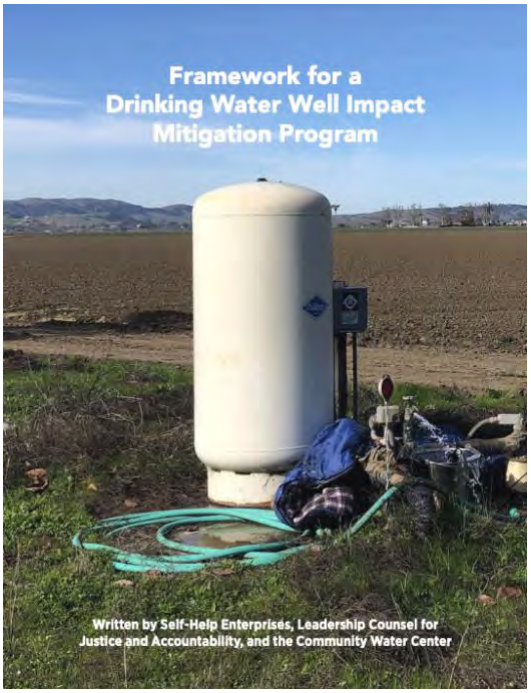


Human Right To Water Scorecard for the Review of Groundwater Sustainability Plans

	Review Criteria *(All Indicators Must be Present in Order to Protect the Human Right to Water)*	Yes/No
A	**Plan Area**	
1	**Does the GSP identify, describe, and provide maps of all of the following beneficial users in the GSA area?**[xii] a. Disadvantaged Communities (DACs). b. Tribes. c. Community water systems. d. Private well communities.	
2	**Land use policies and practices:**[xi] Does the GSP review all relevant policies and practices of land use agencies which could impact groundwater resources? These include but are not limited to the following: a. Water use policies General Plans and local land use and water planning documents b. Plans for development and rezoning. c. Processes for permitting activities which will increase water consumption.	
B	**Basin Setting (Groundwater Conditions and Water Budget)**	
1	Does the **groundwater level conditions** section include past and current drinking water supply issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities?	
2	Does the **groundwater quality conditions** section include past and current drinking water quality issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities, including public water wells that had or have MCLs exceedances?[vi]	
3	Does the **groundwater quality conditions** section include a review of all contaminants with primary drinking water standards known to exist in the GSP area, as well as hexavalent chromium, and PFOs/PFOAs?[xx]	
4	**Incorporating drinking water needs into the water budget:**[xi] Does the Future/Projected Water Budget section explicitly include both the current and projected future drinking water needs of communities on domestic wells and community water systems (including but not limited to infill development and communities' plans for infill development,	

The Human Right to Water Scorecard was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid Groundwater Sustainability Agencies (GSAs) in prioritizing drinking water needs in SGMA. The scorecard identifies elements that must exist in GSPs to adequately protect the Human Right to Drinking water.

Drinking Water Well Impact Mitigation Framework



The Drinking Water Well Impact Mitigation Framework was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid GSAs in the development and implementation of their GSPs. The framework provides a clear roadmap for how a GSA can best structure its data gathering, monitoring network and management actions to proactively monitor and protect drinking water wells and mitigate impacts should they occur.

Groundwater Resource Hub

The Nature Conservancy has developed a suite of tools based on best available science to help GSAs, consultants, and stakeholders efficiently incorporate nature into GSPs. These tools and resources are available online at GroundwaterResourceHub.org. The Nature Conservancy's tools and resources are intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Rooting Depth Database

The Plant Rooting Depth Database provides information that can help assess whether groundwater-dependent vegetation are accessing groundwater. Actual rooting depths will depend on the plant species and site-specific conditions, such as soil type and

availability of other water sources. Site-specific knowledge of depth to groundwater combined with rooting depths will help provide an understanding of the potential groundwater levels are needed to sustain GDEs.

How to use the database

The maximum rooting depth information in the Plant Rooting Depth Database is useful when verifying whether vegetation in the Natural Communities Commonly Associated with Groundwater (NC Dataset) are connected to groundwater. A 30 ft depth-to-groundwater threshold, which is based on averaged global rooting depth data for phreatophytes[1], is relevant for most plants identified in the NC Dataset since most plants have a max rooting depth of less than 30 feet. However, it is important to note that deeper thresholds are necessary for other plants that have reported maximum root depths that exceed the averaged 30 feet threshold, such as valley oak (*Quercus lobata*), Euphrates poplar (*Populus euphratica*), salt cedar (*Tamarix spp.*), and shadescale (*Atriplex confertifolia*). The Nature Conservancy advises that the reported max rooting depth for these deeper-rooted plants be used. For example, a depth-to groundwater threshold of 80 feet should be used instead of the 30 ft threshold, when verifying whether valley oak polygons from the NC Dataset are connected to groundwater. It is important to re-emphasize that actual rooting depth data are limited and will depend on the plant species and site-specific conditions such as soil and aquifer types, and availability to other water sources.

The Plant Rooting Depth Database is an Excel workbook composed of four worksheets:

1. California phreatophyte rooting depth data (included in the NC Dataset)
2. Global phreatophyte rooting depth data
3. Metadata
4. References

How the database was compiled

The Plant Rooting Depth Database is a compilation of rooting depth information for the groundwater-dependent plant species identified in the NC Dataset. Rooting depth data were compiled from published scientific literature and expert opinion through a crowdsourcing campaign. As more information becomes available, the database of rooting depths will be updated. Please Contact Us if you have additional rooting depth data for California phreatophytes.

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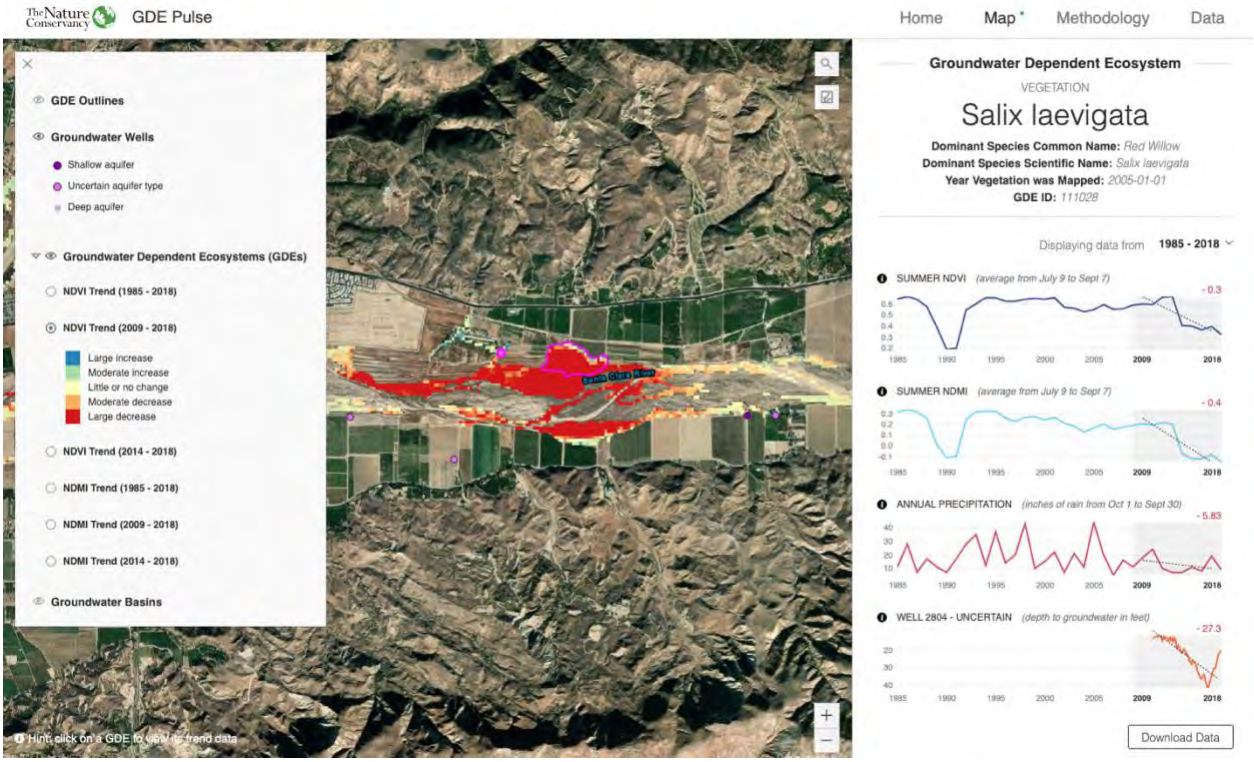
[1] Canadell, J., Jackson, R.B., Ehleringer, J.B. et al. 1996. Maximum rooting depth of vegetation types at the global scale. Oecologia 108, 583–595. https://doi.org/10.1007/BF00329030

GDE Pulse



GDE Pulse is a free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data. Remote sensing data from satellites has been used to monitor the health of vegetation all over the planet. GDE pulse has compiled 35 years of satellite imagery from NASA's Landsat mission for every polygon in the Natural Communities Commonly Associated with Groundwater Dataset. The following datasets are available for downloading:

Normalized Difference Vegetation Index (NDVI) is a satellite-derived index that represents the greenness of vegetation. Healthy green vegetation tends to have a higher NDVI, while dead leaves have a lower NDVI. We calculated the average NDVI during the driest part of the year (July - Sept) to estimate vegetation health when the plants are most likely dependent on groundwater.

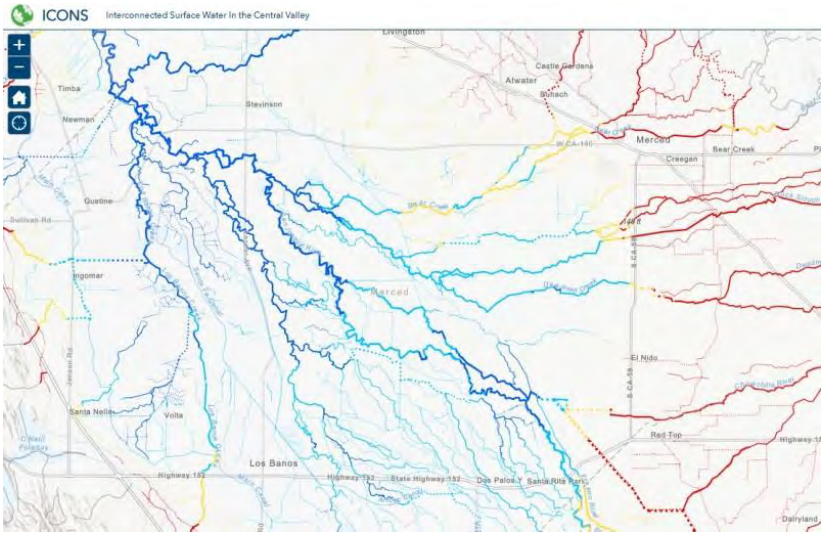
Normalized Difference Moisture Index (NDMI) is a satellite-derived index that represents water content in vegetation. NDMI is derived from the Near-Infrared (NIR) and Short-Wave Infrared (SWIR) channels. Vegetation with adequate access to water tends to have higher NDMI, while vegetation that is water stressed tends to have lower NDMI. We calculated the average NDVI during the driest part of the year (July–September) to estimate vegetation health when the plants are most likely dependent on groundwater.

Annual Precipitation is the total precipitation for the water year (October 1st – September 30th) from the PRISM dataset. The amount of local precipitation can affect vegetation with more precipitation generally leading to higher NDVI and NDMI.

Depth to Groundwater measurements provide an indication of the groundwater levels and changes over time for the surrounding area. We used groundwater well measurements from nearby (<1km) wells to estimate the depth to groundwater below the GDE based on the average elevation of the GDE (using a digital elevation model) minus the measured groundwater surface elevation.

ICONOS Mapper

Interconnected Surface Water in the Central Valley



ICONS maps the likely presence of interconnected surface water (ISW) in the Central Valley using depth to groundwater data. Using data from 2011-2018, the ISW dataset represents the likely connection between surface water and groundwater for rivers and streams in California's Central Valley. It includes information on the mean, maximum, and minimum depth to groundwater for each stream segment over the years with available data, as well as the likely presence of ISW based on the minimum depth to groundwater. The Nature Conservancy developed this database, with guidance and input from expert academics, consultants, and state agencies.

We developed this dataset using groundwater elevation data available online from the California Department of Water Resources (DWR). DWR only provides this data for the Central Valley. For GSAs outside of the valley, who have groundwater well measurements, we recommend following our methods to determine likely ISW in your region. The Nature Conservancy's ISW dataset should be used as a first step in reviewing ISW and should be supplemented with local or more recent groundwater depth data.

Attachment C

Freshwater Species Located in the San Benito River Valley Basin

To assist in identifying the beneficial users of surface water necessary to assess the undesirable result "depletion of interconnected surface waters", Attachment C provides a list of freshwater species located in the San Benito River Valley Basin. To produce the freshwater species list, we used ArcGIS to select features within the California Freshwater Species Database version 2.0.9 within the basin boundary. This database contains information on ~4,000 vertebrates, macroinvertebrates and vascular plants that depend on fresh water for at least one stage of their life cycle. The methods used to compile the California Freshwater Species Database can be found in Howard et al. 2015[1]. The spatial database contains locality observations and/or distribution information from ~400 data sources. The database is housed in the California Department of Fish and Wildlife's BIOS[2] as well as on The Nature Conservancy's science website[3].

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
BIRDS				
Actitis macularius	Spotted Sandpiper			
Aechmophorus occidentalis	Western Grebe			
Agelaius tricolor	Tricolored Blackbird	Bird of Conservation Concern	Special Concern	BSSC - First priority
Anas americana	American Wigeon			
Anas crecca	Green-winged Teal			
Anas platyrhynchos	Mallard			
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron			
Bucephala albeola	Bufflehead			
Butorides virescens	Green Heron			
Calidris minutilla	Least Sandpiper			
Empidonax traillii	Willow Flycatcher	Bird of Conservation Concern	Endangered	
Fulica americana	American Coot			
Gallinago delicata	Wilson's Snipe			
Haliaeetus leucocephalus	Bald Eagle	Bird of Conservation Concern	Endangered	
Himantopus mexicanus	Black-necked Stilt			
Icteria virens	Yellow-breasted Chat		Special Concern	BSSC - Third priority
Megaceryle alcyon	Belted Kingfisher			

[1] Howard, J.K. et al. 2015. Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California. PLoSONE, 11(7). Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130710

[2] California Department of Fish and Wildlife BIOS: https://www.wildlife.ca.gov/data/BIOS

[3] Science for Conservation: https://www.scienceforconservation.org/products/california-freshwater-species-database

Oxyura jamaicensis	Ruddy Duck			
Phalacrocorax auritus	Double-crested Cormorant			
Podilymbus podiceps	Pied-billed Grebe			
Recurvirostra americana	American Avocet			
Setophaga petechia	Yellow Warbler			BSSC - Second priority
Tachycineta bicolor	Tree Swallow			
Tringa melanoleuca	Greater Yellowlegs			
Tringa solitaria	Solitary Sandpiper			
Xanthocephalus xanthocephalus	Yellow-headed Blackbird		Special Concern	BSSC - Third priority
CRUSTACEANS				
Branchinecta lynchi	Vernal Pool Fairy Shrimp	Threatened	Special	IUCN - Vulnerable
Hyalella spp.	Hyalella spp.			
FISH				
Oncorhynchus mykiss - SCCC	South Central California coast steelhead	Threatened	Special Concern	Vulnerable - Moyle 2013
HERPS				
Actinemys marmorata marmorata	Western Pond Turtle		Special Concern	ARSSC
Ambystoma californiense californiense	California Tiger Salamander	Threatened	Threatened	ARSSC
Anaxyrus boreas boreas	Boreal Toad			
Rana boylii	Foothill Yellow-legged Frog	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Rana draytonii	California Red-legged Frog	Threatened	Special Concern	ARSSC
Spea hammondii	Western Spadefoot	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Thamnophis hammondii hammondii	Two-striped Gartersnake		Special Concern	ARSSC
Thamnophis sirtalis sirtalis	Common Gartersnake			
Anaxyrus boreas halophilus	California Toad			ARSSC
Pseudacris regilla	Northern Pacific Chorus Frog			
Pseudacris sierra	Sierran Treefrog			

Thamnophis sirtalis fitchi	Valley Gartersnake			Not on any status lists
Thamnophis sirtalis infernalis	California Red-sided Gartersnake			Not on any status lists
INSECTS & OTHER INVERTS				
Optioservus canus	Pinnacles Optioservus Riffle Beetle		Special	
Sweltsa tamalpa	Tamalpais Sallfly			
Acentrella spp.	Acentrella spp.			
Agabus spp.	Agabus spp.			
Ambrysus spp.	Ambrysus spp.			
Apedilum spp.	Apedilum spp.			
Argia spp.	Argia spp.			
Argia vivida	Vivid Dancer			
Baetidae fam.	Baetidae fam.			
Baetis adonis	A Mayfly			
Baetis spp.	Baetis spp.			
Brechmorhoga mendax	Pale-faced Clubskimmer			
Brillia spp.	Brillia spp.			
Caenis bajaensis	A Mayfly			
Centroptilum spp.	Centroptilum spp.			
Cheumatopsyche spp.	Cheumatopsyche spp.			
Chironomidae fam.	Chironomidae fam.			
Coenagrionidae fam.	Coenagrionidae fam.			
Conchapelopia spp.	Conchapelopia spp.			
Corixidae fam.	Corixidae fam.			
Cricotopus spp.	Cricotopus spp.			
Cryptochironomus spp.	Cryptochironomus spp.			
Cryptotendipes spp.	Cryptotendipes spp.			
Dicrotendipes modestus				Not on any status lists
Erpetogomphus spp.	Erpetogomphus spp.			
Eukiefferiella spp.	Eukiefferiella spp.			
Fallceon quilleri	A Mayfly			
Fallceon spp.	Fallceon spp.			
Gumaga spp.	Gumaga spp.			
Gyrinus spp.	Gyrinus spp.			
Hetaerina americana	American Rubyspot			
Hydropsyche spp.	Hydropsyche spp.			
Hydropsychidae fam.	Hydropsychidae fam.			
Hydroptila spp.	Hydroptila spp.			
Hydroptilidae fam.	Hydroptilidae fam.			
Ischnura denticollis	Black-fronted Forktail			
Ischnura perparva	Western Forktail			
Lepidostoma spp.	Lepidostoma spp.			

Limnophyes spp.	Limnophyes spp.			
Microcylloepus spp.	Microcylloepus spp.			
Micropsectra spp.	Micropsectra spp.			
Microtendipes spp.	Microtendipes spp.			
Nectopsyche spp.	Nectopsyche spp.			
Neotrichia spp.	Neotrichia spp.			
Ochrotrichia spp.	Ochrotrichia spp.			
Paltothemis lineatipes	Red Rock Skimmer			
Pantala hymenaea	Spot-winged Glider			
Parametriocnemus spp.	Parametriocnemus spp.			
Paratendipes spp.	Paratendipes spp.			
Peltodytes spp.	Peltodytes spp.			
Pentaneura spp.	Pentaneura spp.			
Phaenopsectra spp.	Phaenopsectra spp.			
Polypedilum spp.	Polypedilum spp.			
Postelichus spp.	Postelichus spp.			
Psephenus falli				Not on any status lists
Pseudochironomus spp.	Pseudochironomus spp.			
Radotanypus spp.	Radotanypus spp.			
Rheotanytarsus spp.	Rheotanytarsus spp.			
Rhionaeschna multicolor	Blue-eyed Darner			
Sialis spp.	Sialis spp.			
Sigara mckinstryi	A Water Boatman			Not on any status lists
Simulium spp.	Simulium spp.			
Sperchon spp.	Sperchon spp.			
Sympetrum madidum	Red-veined Meadowhawk			
Tanytarsus spp.	Tanytarsus spp.			
Tricorythodes spp.	Tricorythodes spp.			
MOLLUSKS				
Physa spp.	Physa spp.			
Pisidium spp.	Pisidium spp.			
PLANTS				
Azolla filiculoides	NA			
Baccharis salicina				Not on any status lists
Berula erecta	Wild Parsnip			
Callitriche marginata	Winged Water-starwort			
Cotula coronopifolia	NA			
Crassula aquatica	Water Pygmyweed			
Cyperus erythrorhizos	Red-root Flatsedge			
Cyperus squarrosus	Awned Cyperus			

Datisca glomerata	Durango Root			
Elatine californica	California Waterwort			
Eleocharis macrostachya	Creeping Spikerush			
Eleocharis parishii	Parish's Spikerush			
Eleocharis rostellata	Beaked Spikerush			
Euthamia occidentalis	Western Fragrant Goldenrod			
Helenium puberulum	Rosilla			
Hydrocotyle umbellata	Many-flower Marsh-pennywort			
Juncus effusus pacificus				
Juncus phaeocephalus paniculatus	Brownhead Rush			
Juncus xiphioides	Iris-leaf Rush			
Lemna minor	Lesser Duckweed			
Lemna valdiviana	Pale Duckweed			
Limnanthes douglasii douglasii	Douglas' Meadowfoam			
Limosella aquatica	Northern Mudwort			
Mimulus cardinalis	Scarlet Monkeyflower			
Mimulus guttatus	Common Large Monkeyflower			
Mimulus pilosus				Not on any status lists
Montia fontana fontana	Fountain Miner's-lettuce			
Perideridia californica	California Yampah			
Phacelia distans	NA			
Platanus racemosa	California Sycamore			
Potamogeton foliosus foliosus	Leafy Pondweed			
Potamogeton nodosus	Longleaf Pondweed			
Rorippa curvisiliqua curvisiliqua	Curve-pod Yellowcress			
Rumex salicifolius salicifolius	Willow Dock			
Salix exigua exigua	Narrowleaf Willow			
Salix laevigata	Polished Willow			
Salix lasiolepis lasiolepis	Arroyo Willow			
Scirpus microcarpus	Small-fruit Bulrush			
Stachys albens	White-stem Hedge-nettle			
Stachys pycnantha	Short-spike Hedge-nettle			
Typha domingensis	Southern Cattail			

Veronica anagallis-aquatica	NA			
Veronica catenata	NA			Not on any status lists

Attachment D

July 2019

IDENTIFYING GDEs UNDER SGMA

Best Practices for using the NC Dataset

The Sustainable Groundwater Management Act (SGMA) requires that groundwater dependent ecosystems (GDEs) be identified in Groundwater Sustainability Plans (GSPs). As a starting point, the Department of Water Resources (DWR) is providing the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) online[1] to help Groundwater Sustainability Agencies (GSAs), consultants, and stakeholders identify GDEs within individual groundwater basins. To apply information from the NC Dataset to local areas, GSAs should combine it with the best available science on local hydrology, geology, and groundwater levels to verify whether polygons in the NC dataset are likely supported by groundwater in an aquifer (Figure 1)[2]. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.

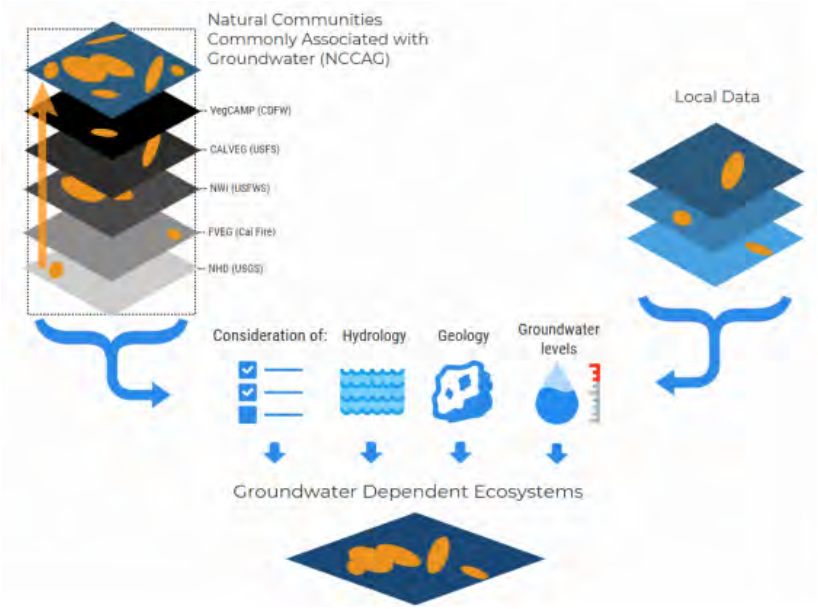


Figure 1. Considerations for GDE identification.
Source: DWR[2]

[1] NC Dataset Online Viewer: https://gis.water.ca.gov/app/NCDatasetViewer/
[2] California Department of Water Resources (DWR). 2018. Summary of the "Natural Communities Commonly Associated with Groundwater" Dataset and Online Web Viewer. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Natural-Communities-Dataset-Summary-Document.pdf

The NC Dataset identifies vegetation and wetland features that are good indicators of a GDE. The dataset is comprised of 48 publicly available state and federal datasets that map vegetation, wetlands, springs, and seeps commonly associated with groundwater in California[3]. It was developed through a collaboration between DWR, the Department of Fish and Wildlife, and The Nature Conservancy (TNC). TNC has also provided detailed guidance on identifying GDEs from the NC dataset[4] on the Groundwater Resource Hub[5], a website dedicated to GDEs.

BEST PRACTICE #1. Establishing a Connection to Groundwater

Groundwater basins can be comprised of one continuous aquifer (Figure 2a) or multiple aquifers stacked on top of each other (Figure 2b). In unconfined aquifers (Figure 2a), using the depth-to-groundwater and the rooting depth of the vegetation is a reasonable method to infer groundwater dependence for GDEs. If groundwater is well below the rooting (and capillary) zone of the plants and any wetland features, the ecosystem is considered disconnected and groundwater management is not likely to affect the ecosystem (Figure 2d). However, it is important to consider local conditions (e.g., soil type, groundwater flow gradients, and aquifer parameters) and to review groundwater depth data from multiple seasons and water year types (wet and dry) because intermittent periods of high groundwater levels can replenish perched clay lenses that serve as the water source for GDEs (Figure 2c). Maintaining these natural groundwater fluctuations are important to sustaining GDE health.

Basins with a stacked series of aquifers (Figure 2b) may have varying levels of pumping across aquifers in the basin, depending on the production capacity or water quality associated with each aquifer. If pumping is concentrated in deeper aquifers, SGMA still requires GSAs to sustainably manage groundwater resources in shallow aquifers, such as perched aquifers, that support springs, surface water, domestic wells, and GDEs (Figure 2). This is because vertical groundwater gradients across aquifers may result in pumping from deeper aquifers to cause adverse impacts onto beneficial users reliant on shallow aquifers or interconnected surface water. The goal of SGMA is to sustainably manage groundwater resources for current and future social, economic, and environmental benefits. While groundwater pumping may not be currently occurring in a shallower aquifer, use of this water may become more appealing and economically viable in future years as pumping restrictions are placed on the deeper production aquifers in the basin to meet the sustainable yield and criteria. Thus, identifying GDEs in the basin should done irrespective to the amount of current pumping occurring in a particular aquifer, so that future impacts on GDEs due to new production can be avoided. A good rule of thumb to follow is: *if groundwater can be pumped from a well - it's an aquifer*.

[3] For more details on the mapping methods, refer to: Klausmeyer, K., J. Howard, T. Keeler-Wolf, K. Davis-Fadtke, R. Hull, A. Lyons. 2018. Mapping Indicators of Groundwater Dependent Ecosystems in California: Methods Report. San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/iGDE_data_paper_20180423.pdf
[4] "Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans" is available at: https://groundwaterresourcehub.org/gde-tools/gsp-guidance-document/
[5] The Groundwater Resource Hub: www.GroundwaterResourceHub.org

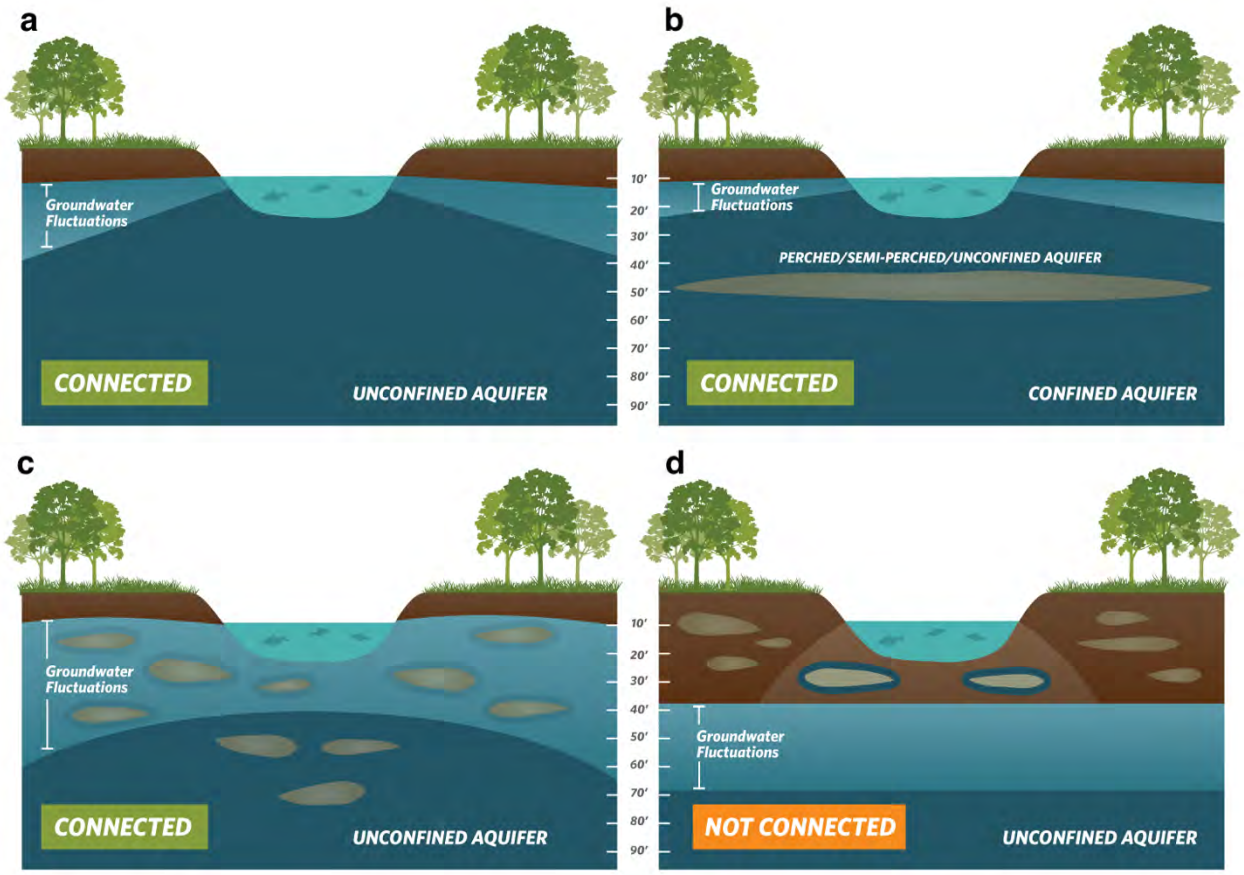


Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. **(b)** Depth-to-groundwater in the shallow aquifer is connected to overlying ecosystem. Pumping predominately occurs in the confined aquifer, but pumping is possible in the shallow aquifer. **Bottom: (c)** Depth-to-groundwater fluctuations are seasonally and interannually large, however, clay layers in the near surface prolong the ecosystem's connection to groundwater. **(d)** Groundwater is disconnected from surface water, and any water in the vadose (unsaturated) zone is due to direct recharge from precipitation and indirect recharge under the surface water feature. These areas are not connected to groundwater and typically support species that do not require access to groundwater to survive.

BEST PRACTICE #2. Characterize Seasonal and Interannual Groundwater Conditions

SGMA requires GSAs to describe current and historical groundwater conditions when identifying GDEs [23 CCR §354.16(g)]. Relying solely on the SGMA benchmark date (January 1, 2015) or any other single point in time to characterize groundwater conditions (e.g., depth-to-groundwater) is inadequate because managing groundwater conditions with data from one time point fails to capture the seasonal and interannual variability typical of California's climate. DWR's Best Management Practices document on water budgets[6] recommends using 10 years of water supply and water budget information to describe how historical conditions have impacted the operation of the basin within sustainable yield, implying that a baseline[7] could be determined based on data between 2005 and 2015. Using this or a similar time period, depending on data availability, is recommended for determining the depth-to-groundwater.

GDEs depend on groundwater levels being close enough to the land surface to interconnect with surface water systems or plant rooting networks. The most practical approach[8] for a GSA to assess whether polygons in the NC dataset are connected to groundwater is to rely on groundwater elevation data. As detailed in TNC's GDE guidance document[4], one of the key factors to consider when mapping GDEs is to contour depth-to-groundwater in the aquifer that is supporting the ecosystem (see Best Practice #5).

Groundwater levels fluctuate over time and space due to California's Mediterranean climate (dry summers and wet winters), climate change (flood and drought years), and subsurface heterogeneity in the subsurface (Figure 3). Many of California's GDEs have adapted to dealing with intermittent periods of water stress, however if these groundwater conditions are prolonged, adverse impacts to GDEs can result. While depth-to-groundwater levels within 30 feet[4] of the land surface are generally accepted as being a proxy for confirming that polygons in the NC dataset are supported by groundwater, it is highly advised that fluctuations in the groundwater regime be characterized to understand the seasonal and interannual groundwater variability in GDEs. Utilizing groundwater data from one point in time can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Time series data on groundwater elevations and depths are available on the SGMA Data Viewer[9]. However, if insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled in the monitoring network (see Best Practice #6).

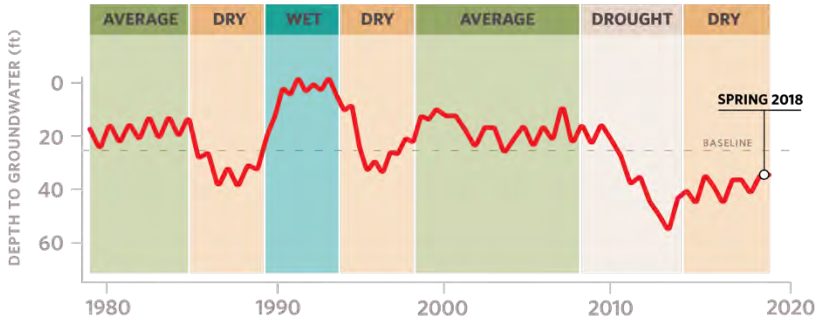


Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so adverse impacts are avoided.

[6] DWR. 2016. Water Budget Best Management Practice. Available at: https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_Water_Budget_Final_2016-12-23.pdf

[7] Baseline is defined under the GSP regulations as "historic information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin." [23 CCR §351(e)]

[8] Groundwater reliance can also be confirmed via stable isotope analysis and geophysical surveys. For more information see The GDE Assessment Toolbox (Appendix IV, GDE Guidance Document for GSPs[4]).

[9] SGMA Data Viewer: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

BEST PRACTICE #3. Ecosystems Often Rely on Both Groundwater and Surface Water

GDEs are plants and animals that rely on groundwater for all or some of its water needs, and thus can be supported by multiple water sources. The presence of non-groundwater sources (e.g., surface water, soil moisture in the vadose zone, applied water, treated wastewater effluent, urban stormwater, irrigated return flow) within and around a GDE does not preclude the possibility that it is supported by groundwater, too. SGMA defines GDEs as "ecological communities and species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" [23 CCR §351(m)]. Hence, depth-to-groundwater data should be used to identify whether NC polygons are supported by groundwater and should be considered GDEs. In addition, SGMA requires that significant and undesirable adverse impacts to beneficial users of surface water be avoided. Beneficial users of surface water include environmental users such as plants or animals[10], which therefore must be considered when developing minimum thresholds for depletions of interconnected surface water.

GSAs are only responsible for impacts to GDEs resulting from groundwater conditions in the basin, so if adverse impacts to GDEs result from the diversion of applied water, treated wastewater, or irrigation return flow away from the GDE, then those impacts will be evaluated by other permitting requirements (e.g., CEQA) and may not be the responsibility of the GSA. However, if adverse impacts occur to the GDE due to changing groundwater conditions resulting from pumping or groundwater management activities, then the GSA would be responsible (Figure 4).

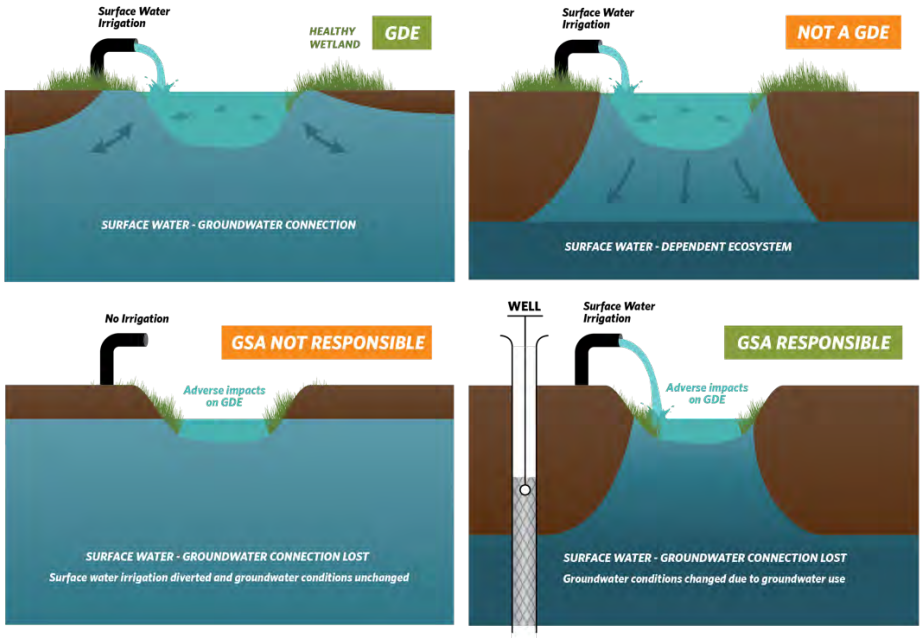


Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. **(Right)** Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. **Bottom: (Left)** An ecosystem that was once dependent on an interconnected surface water, but loses access to groundwater solely due to surface water diversions may not be the GSA's responsibility. **(Right)** Groundwater dependent ecosystems once dependent on an interconnected surface water system, but loses that access due to groundwater pumping is the GSA's responsibility.

[10] For a list of environmental beneficial users of surface water by basin, visit: https://groundwaterresourcehub.org/gde-tools/environmental-surface-water-beneficiaries/

BEST PRACTICE #4. Select Representative Groundwater Wells

Identifying GDEs in a basin requires that groundwater conditions are characterized to confirm whether polygons in the NC dataset are supported by the underlying aquifer. To do this, proximate groundwater wells should be identified to characterize groundwater conditions (Figure 5). When selecting representative wells, it is particularly important to consider the subsurface heterogeneity around NC polygons, especially near surface water features where groundwater and surface water interactions occur around heterogeneous stratigraphic units or aquitards formed by fluvial deposits. The following selection criteria can help ensure groundwater levels are representative of conditions within the GDE area:

- Choose wells that are within 5 kilometers (3.1 miles) of each NC Dataset polygons because they are more likely to reflect the local conditions relevant to the ecosystem. If there are no wells within 5km of the center of a NC dataset polygon, then there is insufficient information to remove the polygon based on groundwater depth. Instead, it should be retained as a potential GDE until there are sufficient data to determine whether or not the NC Dataset polygon is supported by groundwater.

- Choose wells that are screened within the surficial unconfined aquifer and capable of measuring the true water table.

- Avoid relying on wells that have insufficient information on the screened well depth interval for excluding GDEs because they could be providing data on the wrong aquifer. This type of well data should not be used to remove any NC polygons.

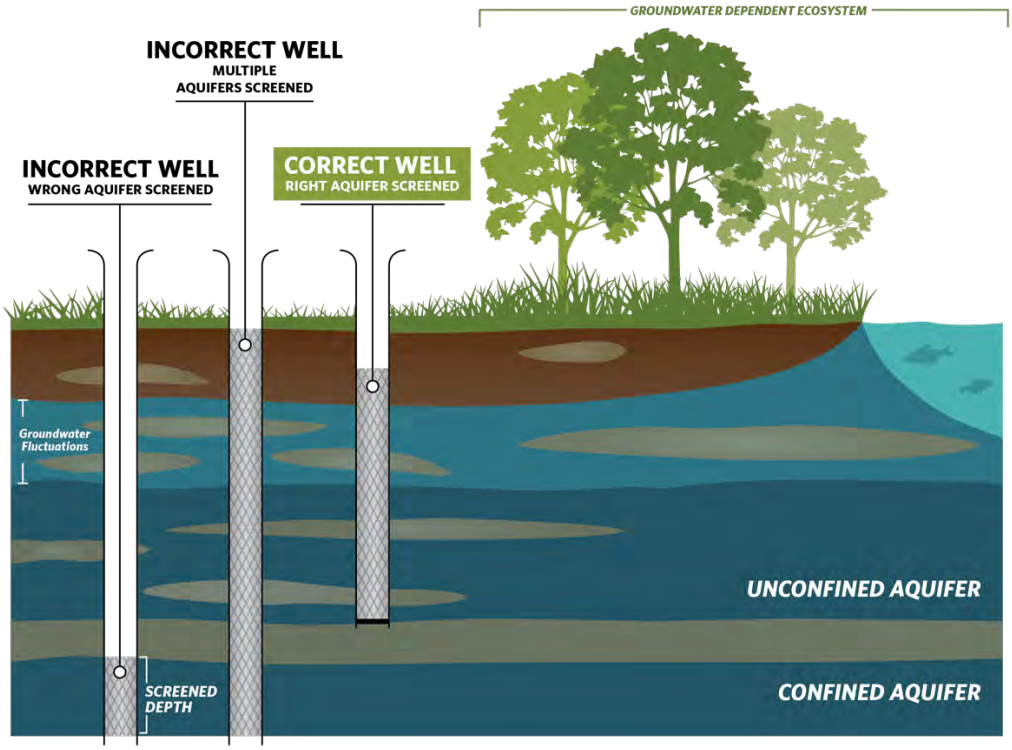


Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

BEST PRACTICE #5. Contouring Groundwater Elevations

The common practice to contour depth-to-groundwater over a large area by interpolating measurements at monitoring wells is unsuitable for assessing whether an ecosystem is supported by groundwater. This practice causes errors when the land surface contains features like stream and wetland depressions because it assumes the land surface is constant across the landscape and depth-to-groundwater is constant below these low-lying areas (Figure 6a). A more accurate approach is to interpolate **groundwater elevations** at monitoring wells to get groundwater elevation contours across the landscape. This layer can then be subtracted from land surface elevations from a Digital Elevation Model (DEM)[11] to estimate depth-to-groundwater contours across the landscape (Figure b; Figure 7). This will provide a much more accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.

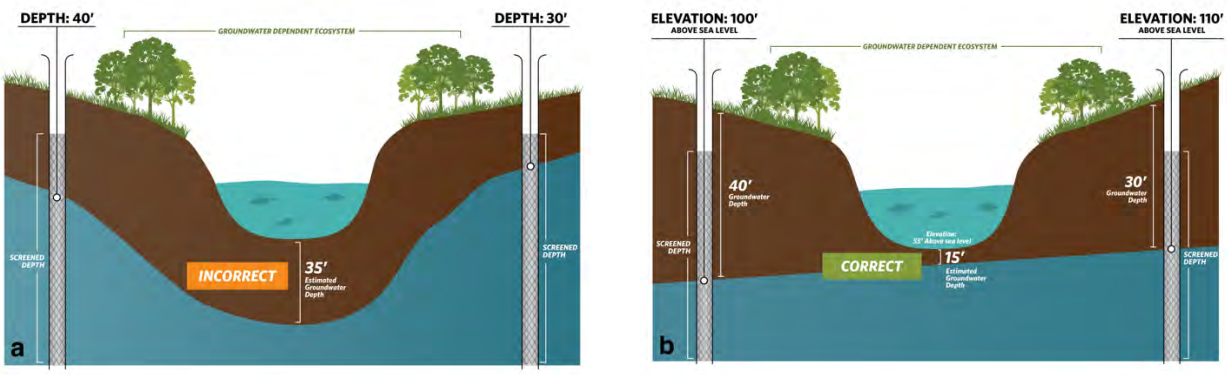


Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. **(b)** Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

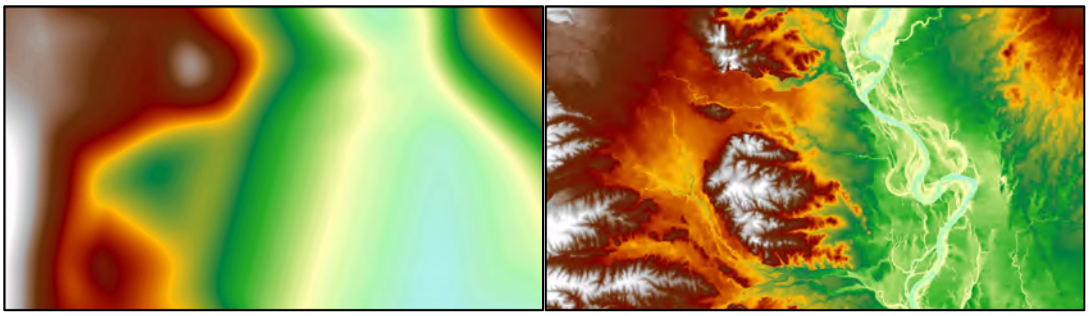


Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. **(Right)** Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation from DEM spatial data to generate depth-to-groundwater contours. The image on the right shows a more accurate depth-to-groundwater estimate because it takes the local topography and elevation changes into account.

[11] USGS Digital Elevation Model data products are described at: https://www.usgs.gov/core-science-systems/ngp/3dep/about-3dep-products-services and can be downloaded at: https://iewer.nationalmap.gov/basic/

BEST PRACTICE #6. Best Available Science

Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decisions, and using the data collected through monitoring programs to revise decisions in the future. In many situations, the hydrologic connection of NC dataset polygons will not initially be clearly understood if site-specific groundwater monitoring data are not available. If sufficient data are not available in time for the 2020/2022 plan, **The Nature Conservancy strongly advises that questionable polygons from the NC dataset be included in the GSP until data gaps are reconciled in the monitoring network.** Erring on the side of caution will help minimize inadvertent impacts to GDEs as a result of groundwater use and management actions during SGMA implementation.

KEY DEFINITIONS

Groundwater basin is an aquifer or stacked series of aquifers with reasonably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom. *23 CCR §341(g)(1)*

Groundwater dependent ecosystem (GDE) are ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. *23 CCR §351(m)*

Interconnected surface water (ISW) surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. *23 CCR §351(o)*

Principal aquifers are aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. *23 CCR §351(aa)*

ABOUT US

The Nature Conservancy is a science-based nonprofit organization whose mission is *to conserve the lands and waters on which all life depends*. To support successful SGMA implementation that meets the future needs of people, the economy, and the environment, TNC has developed tools and resources (www.groundwaterresourcehub.org) intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

October 27, 2021

San Benito County Water District
Groundwater Sustainability Agency
30 Mansfield Road
Hollister, California 95023

Re: Public Comment on North San Benito County Groundwater Sustainability Plan Public Draft

To the San Benito County Water District (SBWCD) Groundwater Sustainability Agency (GSA):

A consortium of agricultural growers known as Sustainable Water for Agriculture (SGFA) maintains agricultural operations in the North San Benito Groundwater Basin (the Basin). SGFA retained Groundwater Solutions Inc. to perform a brief technical review of the Draft GSP (dated June 30, 2021) and to provide suggestions for public comment of the draft GSP. The attached comments are provided to the GSAs for consideration in the preparation of the final GSP submitted for approval to the Department of Water Resources.

Sincerely,

GSI WATER SOLUTIONS, INC.

Nate Page, P.G.
Managing Hydrogeologist

Dave O'Rourke, P.G., CHg.
Supervising Hydrogeologist

5855 Capistrano Avenue, Suite C Atascadero, CA 93422 P: 805.460.4621 info@gsiws.com www.gsiws.com

The following comments on the North San Benito County Groundwater Sustainability Plan Public Draft are made on behalf of Sustainable Water for Agriculture (SGFA).

1. **Section 2.1.5.3 San Benito County General Plan Influences on GSA Ability to Achieve Sustainability (Page 2-16, PDF page 53)** presents a possible conflict between the General Plan and GSP: *"(County) land use planning could affect the ability of the GSA to achieve sustainable groundwater management over the planning and implementation horizon. This would occur chiefly by land use planning agencies allowing or promoting land use development (agricultural, urban, or rural) in the basin or watershed with net increases in water demand that challenge the GSAs' ability to secure water supply in a timely or cost-effective manner.*" This section also cites the requirements for developments to prepare Water Supply Assessments. We suggest that the GSP should require preparation and approval of a WSA for any development involving new groundwater demand.
2. **Figure 3-11 (PDF page 102)**. The legend references only groundwater recharge areas. Suggest changing the title to reference groundwater recharge only.
3. **Section 4.1.3**. In GSP Section 3.7 states that faulting has been indicated to affect groundwater flow within the Basin in some locations and in some conditions (LSCE, 1991 and Todd, 2015). Evaluation of groundwater elevations across fault traces has shown that large groundwater gradients sometimes exist on portions of the Calaveras Fault in the north of the Basin (LSCE, 1991 and Todd, 2015). It is unclear whether this has been adequately considered during selection of Key Wells in Bolsa Management Area (MA).
4. **Figures 4-8 and 4-9 (PDF pages 133 and 134/357)**, Groundwater Elevation Contours, would be more informative if the elevation data for each well was displayed.
5. **Page 4-12 (PDF page 114/357). Section 4.7.1 – Water Quality Goals**. "The recommended SMCL for TDS is 500 mg/L with an upper limit of 1,000 mg/L…". The inclusion of a "limit" of 500 mg/L seems unnecessary and confusing if the actual limit is 1,000 mg/L. This appears to reflect language from the General Plan. However, it's not useful to repeat this language if there is no direct impact on the GSP, or the minimum thresholds established for water quality in the GSP. Almost none of the water quality data presented for the Basin is lower than 500 mg/L, so it only serves to create a reference that is not likely to be achieved, implying a failure of an existing regulatory program.
6. **Figures 4-19 and 4-21 (PDF pages 144 and 146/357)** display transient chemographs for TDS and nitrates. The display of these data would be easier to interpret if individual graphs were placed on a map, as they are with the hydrographs in Figures 4-4 through 4-7. Then the reader would not need to refer back to a location map (Figure 4-15) to find out the locations of the individual points.
7. **Figures 4-19 and 4-21 (PDF pages 144 and 146/357)** Some of the data trends presented in Figures 4-19 and 4-21 are not immediately intuitive, and may merit some discussion in the text. For example, in Figure 4-19, TDS concentrations in well MW-42 are stable at about 400 mg/L for over a decade, then spike suddenly to the 1,500-1,900 range after 2015. In Figure 4-21, nitrate concentrations for well MW-31 increase suddenly from around 50 mg/L to over 200 mg/L after

2008. Interpretation of these data may be more obvious if individual graphs were displayed on a map, as discussed in Comment 6.

8. **Page 4-15 (PDF page 118/357). Section 4.8.1 - Selenium**. The text in this discussion mixes units, referencing both mg/L and ug/L, which creates some confusion. Recommend using consistent units in this discussion. Same comment for Section 4.8.3 – Boron.
9. **Page 4-16 (PDF page 118/357). Section 4.8.3 – Boron**. The second paragraph references an area of historically elevated boron concentration. If this text is presented, it may be helpful to include a display of the area on one of the existing figures.
10. **Page 4-16 (PDF page 118/357).** There appears to be a typographical error in the "Arsenic" paragraph of this section.
11. **Page 4-18, paragraph 2 (PDF page 120).** This sentence may not be necessary and should be considered for removal from the GSP: "*If a gaining stream is the natural discharge point for a groundwater basin, pumping anywhere in the basin can potentially decrease the outflow, particularly over long time periods such as multi-year droughts."*
12. **Figure 4-22 (PDF page 147)**, general comment on display. Groundwater elevation contours are the same color as roads, and some of the road labels are hard to find (like Highway 156). The text references the road locations, but these are difficult to find on the figure. Suggest some graphical revisions to this figure for clarity.
13. **Tables 5-3 and 5-4 (PDF pages 160,161).** Outflows are greater than inflows in Table 5-3 and 5-4. It is stated in the text description of Tables 5-2 through 5-4 inflows equal outflows. Inflows do equal outflows in table 5-3 and 5-4 if CVP imports are not included in the sum of inflows. The rationale is included as the last sentence on page 5-8. Perhaps a note should be included on the tables. Note in Table 5-3 and 5-4, 1st column, last row, "except CVP" has a typo.
14. **Figures 5-12 and 5-13 (formerly 5-10 and 5-11) (PDF page 186,187).** GSI recommends that the line graphs shown on these figures be labeled as representing Cumulative Change in Storage for greater clarity.
15. **Water Budget**. GSI recommends the development of a consolidated table and a consolidated figure showing the basin-wide water balance.
16. **Table 6-1 (PDF page 197/357).** The 5th column in this table lists the minimum thresholds proposed for the key wells, and are discussed as such in the ensuing text. This column should simply be labelled with reference to "Minimum Thresholds", thus using the SGMA language and making the MTs clear.
17. **Page 6-12 (PDF page 199).** The definition of the Minimum Threshold for Chronic Lowering of Groundwater Levels reads: "*The Minimum Threshold for defining undesirable results relative to chronic lowering of groundwater levels is defined at each Key Well by historical groundwater low levels adjusted to provide reasonable protection to nearby existing wells. Undesirable results are indicated when two consecutive exceedances occur in each of two consecutive years, in sixty percent or more of the Key Wells* ***in each Management Area***." Based on the description provided in the previous paragraph *"… undesirable results could occur in one MA and not the others.*" Considering this, we suggest that the bold text in the MT definition above be replaced with: "…**to be assessed separately for each Management Area**".
18. **Section 6.2.7 (page 6-14, PDF page 201/357).** It is our interpretation of SGMA requirements that Measurable Objectives (MOs) be defined as a numerical value. Section 6.2.7 (page 6-14, PDF page 201/357) uses vague language of "…to maintain groundwater levels within the operating

range…". We suggest that a specific numerical water level indicative of current average or high water conditions be selected for each key well, and included in Table 6-1 as a column. This would maintain the current approach as presented but would define MOs with greater specificity as required by SGMA.

19. **Page 6-19 (PDF page 206/357).** It would provide clarity if the paragraph beginning "The Minimum Threshold for storage…" specifically referenced the numerical values presented in Table 6-1.
20. **Section 4.7.4 Page 4-14 (PDF page 116).** The statement made about average nitrate concentrations in the first paragraph (and presented in Table 4-3) does not seem consistent with the data presented on Page 6-32, including Table 6-4.
21. **Page 6-32 to 6-34 (PDF pages 219-221).** Considering the expected increase in TDS and N concentrations in groundwater documented in the GSP it seems overly aggressive to set the MTs for each constituent as the percentage of wells with concentrations exceeding the regulatory criteria based on current conditions (2015-2017). This definition means that current conditions = undesirable result. With projected increases in both TDS and N concentrations this leaves no room for potential corrective actions and sets the Basin up for immediate non-compliance. Consider revising to less stringent thresholds that do not result in immediate non-compliance for TDS and N concentrations in groundwater.
22. **Tables 6-4 and 6-5. (Page 6-32 and 6-33, PDF pages 219-220/357).** The percentage values presented in these tables are discussed and presented in the text as the Minimum Threshold criteria for water quality for TDS and nitrates. Therefore, we suggest it would provide greater clarity if the term "Minimum Threshold" were utilized in the table title or column headers.
23. **Page 6-46,47 (PDF pages 233,234).** The SMC for Depletion of Interconnected Surface Water is set using groundwater elevations in deep aquifer wells as a proxy. This is not appropriate considering ample evidence presented in the GSP that the shallow alluvial aquifer behaves independently from the deep aquifer. GSI recommends that time series Enhanced Vegetation Index (EVI) analyses be considered to supplement use of deep aquifer monitoring well groundwater elevations as proxy MTs for the Depletion of Interconnected SW SMC. The deep aquifer wells operate independently from the alluvial aquifer as evidenced by the comparison made between NDVI/NDMI and calibrated groundwater model water level fluctuations presented in the GSP (see GSP Fig. 6-9). This lack of correlation demonstrates the poor utility of using the deep aquifer wells to monitor the interconnected SW SMC.
24. **Groundwater Dependent Ecosystems (GDEs)**
    a. Nowhere are GDEs specifically identified in the GSP (this is a requirement of SGMA)
    b. **Section 4.11:** The GSP seems to conflate Riparian Vegetation with vegetation GDEs. This is probably OK, but to satisfy SGMA requirements the GSP should specifically identify these as vegetation GDEs if that is what the author believe they represent,
    c. **Page 4-19 (PDF page 121).** In the process of identifying Riparian Vegetation the GSP mischaracterizes the shallow alluvial water table as "streambank irrigation". This term is misleading. While the shallow alluvial water table may exist due to so called "streambank irrigation" from a losing stream reach it is still in-fact a shallow alluvial water table. The GSP describes an effort to avoid including these "streambank irrigated" vegetation areas from inclusion in the Riparian Vegetation classification by using a 100-ft minimum width screening step. This does not seem appropriate. Regardless, if one

zooms way in, the resulting Riparian Vegetation extent shown on GSP Fig. 4-22 appears to be reasonable.

25. **Section 8.7.1.3.** The GSP states that SBCWD water quality sampling is completed quarterly to semiannually. In response to a prior comment suggesting that this interval of sampling is overkill Todd's response indicated the revised text of the Public Draft GSP would indicate a minimum interval of annual sampling here and in Section 6.6.4.1. This recommendation is not stated clearly in the text.
26. **Subsidence**: The GSP includes statements suggesting that, while no subsidence problems have been reported, there is a relationship between subsidence and local groundwater pumping. However, this supposed relationship is not supported by the GPS land surface elevation data presented in Figure 4-14 which show, at most, a land surface decline of 1 inch between 2004 and 2018. The InSAR data on Figures 4-12 and 4-14 are inconsistent with each other, with the GPS data, and with groundwater levels which were not declining during the time periods of the InSAR data. The GSP should be modified to remove statements that subsidence associated with groundwater extraction is occurring and to clarify the discrepancies in the datasets.
27. **The Groundwater Model Report** tables and figures are not included in **Appendix G**. Please provide.

San Benito County Water District

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November 15, 2021

To whom it may concern:

Throughout preparation of the Groundwater Sustainability Plan (GSP) for North San Benito Basin, the San Benito County Water District and Valley Water have encouraged and welcomed public input. Two public comment letters on the North San Benito Basin Draft GSP were received from the following:

1. The Nature Conservancy, Audubon California, Local Government Commission, Union of Concerned Scientists, and Clean Water Action/Clean Water Fund
2. GSI Water Solutions, Inc. on behalf of Sustainable Water for Agriculture (SGFA)

These letters are reproduced in this Appendix I to the Final GSP. The GSP staff and consultant team have been reviewing the Draft GSP and making some updates and edits. The comment letters have been reviewed as part of this process and responses are provided below. A table of changes to the draft GSP also is provided.

Sincerely,

Jeff Cattaneo
District Manager

COMMENT LETTER 1 – THE NATURE CONSERVANCY, AUDUBON CALIFORNIA, LOCAL GOVERNMENT COMMISSION, UNION OF CONCERNED SCIENTISTS, AND CLEAN WATER ACTION/CLEAN WATER FUND

Responses are organized according to the Specific Comments in Attachment A to the letter.

COMMENT 1. ***Beneficial uses and users are not sufficiently considered in GSP development***

COMMENT 1a. ***Human Right to Water considerations are not sufficiently incorporated.***

Multiple topics were included in this comment; these are presented with responses by topic below.

Comment:

> ***The identification of Disadvantaged Communities (DACs) and drinking water users is insufficient.***

Response:

> Figure 2-6 (showing Disadvantaged Communities) and accompanying text have been updated with most recent mapping from DWR. Available information on existing wells (including private domestic wells) is provided in Section 6.2.5.2. The importance of documenting private wells is indicated in GSP Section 7.5.2, which recommends improvement of the well inventory.

Comment:

> ***The identification of Interconnected Surface Waters (ISWs) is insufficient, due to lack of supporting information provided for the ISW analysis.***

Response:

> The comment quotes a GSP section that acknowledges that available groundwater elevation data are not adequate for identifying stream reaches interconnected with groundwater because the data are from deep wells. The GSP agrees with this assessment and commits to installing shallow monitoring wells along potentially interconnected stream reaches (which are also areas of potential riparian vegetation GDEs), as described in Section 8.10.1. Six shallow wells have already been installed as of October 2021.
>
> The comment states that the GSP shows a map of depth to water only for 2017. Please see Figure 6-6, which shows depth to water in 1992 and 1998.
>
> The comment on Figure 4-22 misunderstands gaining and losing stream reaches. Gaining stream reaches are inherently interconnected with groundwater because groundwater discharge into the stream produces the increase in flow. The converse is not true: losing reaches may be interconnected or not depending on whether there is an unsaturated zone between the bottom of the stream bed and the underlying water table. Most stream reaches in the Basin are losing, and of those, most are probably not connected based on available water-level data. To clarify this distinction with respect to Figure 6-6, the legend entry has been changed to "Gaining stream reach (potential riparian GDE)".
>
> Thank you for pointing out the discrepancy between Figure 4-22 and Figure 6-6, which were developed at different times from different data sets. Figure 4-22 has been revised to include the more extensive delineation of potential riparian vegetation GDEs. The reference to Figure 4-

22 has been moved up to the paragraph stating that interconnected stream reaches were identified based on three factors: stream flow measurements, groundwater levels, and the presence of dense riparian vegetation.

Comment:

The identification of Groundwater Dependent Ecosystems (GDEs) is insufficient, due to a lack of comprehensive, systematic analysis of the basin's GDEs.

Response:

The comment notes a lack of a clear definition of GDE. Explicit definitions matching what was implicit in the text have been added to sections 4.11.4 and 4.11.7.

We disagree that the ISW and GDE analysis was not "systematic". It was extensive and made use of all available relevant data.

The lack of shallow groundwater elevation data near streams is freely acknowledged in the GSP, along with a commitment to install new shallow monitoring wells. The apparent lack of correlation between vegetation conditions and depth to water in deep wells could simply confirm that deep-well water levels do not indicate the true water table depth near streams (or it could indicate that the vegetation is facultatively phreatophytic).

The GSP does provide a map of GDEs in Figure 4-22. As noted above, we are expanding the riparian phreatophyte reaches in this figure to match the ones in Figure 6-6.

Regarding the period of analysis, it was remarkable that the DTW<30 feet regions for 1992 and 1998 were so similar given the difference in hydrologic conditions (end of drought versus end of wet period). Figure 6-5 shows hydrographs for 12 wells near riparian vegetation GDE stream reaches. So, the variability in riparian conditions is in fact documented in the GSP.

One of the recommendations provided after the comment is to develop complete lists of GDE species. We agree that listed species deserve individual attention. The three species present in the area (that are not exclusively upland species) are individually considered: California red-legged frog, California tiger salamander and steelhead (see Section 4.11.28 and Figure 4-24). Potential effects of the GSP on steelhead are evaluated extensively in the passage flow analysis (Sections 6.7.2.5 and 6.7.2.6). Beyond those species, it is reasonable and adequate to evaluate potential GSP effects at the community level, which in this case consists of phreatophytic riparian vegetation and vegetation surrounding a small number of springs. To the extent that groundwater management affects the vegetation community, it presumably affects most of the species within the community. By the same token, non-listed aquatic organisms are assumed to rise and fall along with steelhead if hydrologic conditions change.

Comment:

Native vegetation and managed wetlands are water use sectors that are required to be included in the water budget. The integration of these ecosystems into the water budget is insufficient.

Response:

A sentence has been added to acknowledge the Pajaro River Wetland Mitigation Bank in the Water Balance Section 5.3.4: "The Bolsa MA includes the Pajaro River Wetland Mitigation Bank (see Figure 2-1), which contains 273 acres; the water source and use is not known."

The following text has been added to Section 6.7.6.3 Effect of Minimum Threshold on Beneficial Uses: "The Pajaro River Wetlands Mitigation Bank is adjacent to a stream reach identified as a riparian vegetation GDE and hence is covered by the minimum threshold for depletion of interconnected surface water (GSP page 6-47). It includes approximately 100 acres of wetland, much of which is seasonal (Wildlands, Inc. 2021). Groundwater conditions are highly confined in the Bolsa area where the wetland is located. Historical groundwater levels in the nearest monitored well (11S/4E-26B1) are close to the ground surface, exhibit no long-term declines and have modest declines during droughts. The lowest spring water level during 1987-1992 (which is the MT definition) was only 20 feet below the ground surface. The water table elevation near the ground surface is certainly higher and more stable. The wetland was established after 1992, but there is no reason to expect any adverse effect associated with groundwater levels if they decline to the MT in the future."

COMMENT 1b. ***Public trust resources are not sufficiently considered. Stakeholder engagement during GSP development is insufficient.***

Response:

An updated Community Engagement Plan is included in GSP Appendix D. Strategies for engaging the general public, including DACs, were revised to comply with public health orders addressing the COVID-19 pandemic. Nonetheless, outreach continued through Zoom meetings, updates to the SBCWD website, and other media. Many the people living in the DAC areas are relatively recent immigrants from Spanish-speaking countries, and website pages and other materials are available in Spanish.

Opportunities for future engagement are included in Section 8 Projects and Management Actions as part of ongoing activities such as Section 8.6 Enhance Water Conservation and 8.12 Provide Administration, Monitoring, and Reporting.

COMMENT 1c. ***Impacts of Minimum Thresholds, Measurable Objectives and Undesirable Results on beneficial uses and users are not sufficiently analyzed.***

Multiple topics were included in this comment; these are presented with responses by topic below.

Comment:

For chronic lowering of groundwater levels, minimum thresholds are initially set at historical groundwater level lows and then adjusted upward to be more protective. The GSP acknowledges the impact of minimum thresholds on DACs, by stating justification of the minimum threshold levels as (p. 6-8): "Upward adjustment to be protective in the San Juan Economically Disadvantaged Area." The GSP does not state what the impacts of the minimum thresholds to DACs and drinking water users would be, however, when describing undesirable results.

Response:

Sections 6.2.1 through 6.2.4 describe potential undesirable results of groundwater level declines, with detailed explanation of what happens in production wells as groundwater levels decline. A focus is placed on shallow private wells, which often are domestic wells providing drinking water supply to residents (including those in the San Juan DAC). To minimize any dewatering of wells, the MTs are defined at or above historical lows and account for wells drilled since the historical lows occurred. Undesirable results (such as dewatering of domestic wells) are not anticipated due to MTs. With availability of CVP water, the basin has been maintained with relatively high groundwater levels and no private wells have been reported to have water shortages in the DWR *Household Water Supply Shortage Reporting System*.

As discussed in Section 4.8, the water quality constituents mentioned in the comment are mostly naturally occurring. These are managed under existing programs and are monitored regularly by the GSAs. No undesirable effects of constituent mobilization due to groundwater use or basin management have been identified in this basin. North San Benito has been characterized by maintenance of groundwater levels within a stable operating range, which will be continued given the groundwater level MTs. The GSAs (and other agencies) will continue to monitor water quality as discussed in Section 7.1.5.

Comment:

Sustainable management criteria for chronic lowering of groundwater levels provided in the GSP do not consider potential impacts to environmental beneficial users.

Response:

The comment suggests that the assumed rooting depth for riparian phreatophytes be increased to 80 feet because valley oak trees reportedly can have roots that deep. If water levels were managed to that depth, all obligate phreatophytes would likely perish. Although some valley oaks might tap into groundwater at that depth, that species is clearly not an obligate phreatophyte as demonstrated by centuries-old specimens near McCloskey Road where water levels were over 150 feet below the ground surface for many years while groundwater was overpumped during the 1920s to 1970s.

The GSP does reference the TNC rooting depth database (Section 6.7.2.3). However, it was not useful for predicting the occurrence of phreatophytes because many of the values in the database are too small. Instead, we relied on empirical observations of where phreatophytes actually occur in the Basin, which is in areas where the depth to water (as estimated from water supply wells) is less than 20 feet.

The comment asserts that the GSP does not state how the NDVI-NDMI-water level analysis "helps to inform the development of SMC that are protective of terrestrial GDEs". That is because the analysis (in Section 6.7.2.4) found no empirical correlation between changes in depth to water and changes in NDVI or NDMI. Therefore, the NDVI and NDMI data are not useful in this case for establishing water level criteria protective of GDEs. Instead, the GSP relies on the correlation of measured and simulated depths to water with the presence of riparian vegetation GDEs as the basis for the SMC. The lack of correlation between water levels and

NDVI/NDMI could be due to the use of water levels not representative of the true water table. This data gap is being addressed and will inform the GSP update five years from now.

One of the recommendations following the comment is to use biological metrics to evaluate the occurrence of undesirable results. This has some merit, given the uncertain relationship between water levels and vegetation health. However, it also introduces confounding variables that can also affect vegetation health, including outbreaks of pests and diseases, below-average rainfall and streamflow, flood scour, agricultural clearing, and fire. On balance, the stakeholders opted to stick with hydrologic variables more clearly linked to groundwater management.

COMMENT 2. ***Climate change is not sufficiently considered.***

Response:

The comment states that "the plan does not consider multiple climate scenarios (e.g., the 2070 extremely wet and extremely dry climate scenarios) in the projected water budget." The comment appears to be referring to two alternative sets of monthly climate multipliers provided in the files of climate change factors downloadable from the SGMA Data Portal. Those sets of factors are labeled Drier/Extreme-Warming (DEW) and Wetter/Moderate-Warming (WMW). There is no requirement to use anything but the expected factors. In fact, the DWR document "Guidance for Climate Change Data Use during Groundwater Sustainability Plan Development" does not even mention the alternative data sets. Rather, Section 4.5 of the guidance document states that uncertainty in climate change predictions is represented by inter-annual variability in the 50-year future simulations. It also states that the evaluation of sustainability will be based on the "central tendency" of the climate change factors, which is represented by the primary climate factor data set. The DEW and WMW data sets are for optional research purposes. Therefore, the climate change analysis in the GSP is adequate.

Our interpretation is that DWR is requesting two water budgets only (2030 and 2070) and that "uncertainty" is represented by the interannual variability represented by the 50 years of analysis. In other words, the climate change scenario is itself an expression of uncertainty relative to the future baseline scenario. Also, projects are evaluated on the "central tendency", which is based on the expected climate change factors (the ones used in the GSP climate change analysis). There is no requirement for additional analysis of alternative climate change factor sets such as those identified in the comment.

COMMENT 3. ***Data gaps are not sufficiently identified and the GSP does not have a plan to eliminate them.***

Response:

The comment incorrectly asserts that Sections 6.7.7.1, 7.1.6 and 8.10.2 include "proposed GDE-related biological monitoring". This is incorrect. The GSP does not propose biological monitoring. It does recommend a study to identify the critical riffle for steelhead passage along the San Benito River. That is an analysis of physical variables (stream channel morphology and flow hydraulics), not monitoring of biological variables.

Figures 7-1 and 7-4, showing monitoring well locations, do not show DACs, but comparison between Figures 2-6 (DACs) and the monitoring wells on Figures 7-1 and 7-4 indicates monitoring wells in and near the San Juan and Hollister DACs. Figure 6-1 shows how existing

private wells are associated with the Key Wells, including those in the DACs. As of 2021, new shallow and deep monitoring wells are being installed to fill gap areas.

COMMENT 4. ***Projects and Management Actions do not sufficiently consider potential impacts or benefits to beneficial uses and users.***

Response:

The comment asserts that GSP Chapter 8 Projects and Management Actions is inadequate "due to the failure to completely identify benefits or impacts of identified projects and management actions … to key beneficial users of groundwater such as GDEs, aquatic habitats…" We disagree. The two-page discussion of management actions related to GDEs (Section 8.10) focuses on two foundational actions that will enable better management of GDEs: shallow monitoring wells near streams and identification of the critical riffle and flow requirement for steelhead passage along the San Benito River. Those efforts will clearly benefit GDEs. Similarly, the text lists five management actions that could be implemented to raise groundwater levels near riparian vegetation GDEs and/or improve fish passage flows. The discussion is ample and adequate.

Section 8 summarizes numerous projects and management actions, including description of project benefits of each. Benefits to DACs, domestic wells, GDEs, and ISWs are incorporated. Three examples:

- Section 8.5.3.7 describes how the North County Project provides high quality water to the Hollister Urban Area (which includes DACs).
- Section 8.5.4.8 describes how managed percolation helps maintain groundwater levels and storage and enhances water quality with benefits to the Southern, Hollister and San Juan MAs downstream. These areas include numerous private wells and DACs.
- Section 8.10 describes actions to better monitor Interconnected Surface Water and GDEs and to explore means to reduce potential impacts (see above).

COMMENT LETTER 2 – GSI WATER SOLUTIONS, INC. ON BEHALF OF SUSTAINABLE WATER FOR AGRICULTURE (SGFA)

Responses are organized according to the numbered comments in the letter.

COMMENT 1. ***Section 2.1.5.3 San Benito County General Plan Influences on GSA Ability to Achieve Sustainability (Page 2-16, PDF page 53)*** *presents a possible conflict between the General Plan and GSP: "(County) land use planning could affect the ability of the GSA to achieve sustainable groundwater management over the planning and implementation horizon. This would occur chiefly by land use planning agencies allowing or promoting land use development (agricultural, urban, or rural) in the basin or watershed with net increases in water demand that challenge the GSAs' ability to secure water supply in a timely or cost-effective manner." This section also cites the requirements for developments to prepare Water Supply Assessments. We suggest that the GSP should require preparation and approval of a WSA for any development involving new groundwater demand.*

Response:

The Section Heading is General Plan Influences on GSA Ability to Achieve Sustainability and refers to all General Plans (consistent with the GSP Regulations), not just San Benito County. San Benito County is responsible for land use planning over most of the Plan Area and this section includes a straightforward assessment that the County General Plan contains little policy to manage land use within the constraints of available water supply. However, the County has participated in preparation of the GSP, including representation in the Technical Advisory Committee and provision of comments on draft sections. The County and SBCWD GSA have discussed potential issues of land use and water supply. As stated, the County acknowledges Water Supply Assessments, which are required for residential, commercial, industrial projects of a certain size. The County would be responsible for expanding requirements for such assessments and not the GSA through its GSP. In fact, SGMA states clearly in §10726.89(f) that a GSP cannot supersede the land use authority of cities and counties.

COMMENT 2. ***Figure 3-11 (PDF page 102)****. The legend references only groundwater recharge areas. Suggest changing the title to reference groundwater recharge only.*

Response:

A footnote regarding discharge has been added to this figure. The components of recharge and discharge are discussed in the text.

COMMENT 3. ***Section 4.1.3****. In GSP Section 3.7 states that faulting has been indicated to affect groundwaterflow within the Basin in some locations and in some conditions (LSCE, 1991 and Todd, 2015). Evaluation of groundwater elevations across fault traces has shown that large groundwater gradients sometimes exist on portions of the Calaveras Fault in the north of the Basin (LSCE, 1991 and Todd, 2015). It is unclear whether this has been adequately considered during selection of Key Wells in Bolsa*

Management Area (MA).

Response:

Key well selection included assessment of locations relevant to structures affecting groundwater from the hydrogeologic conceptual model, including faults. The GSP has been edited to clarify inclusion of this selection component.

COMMENT 4. ***Figures 4-8 and 4-9 (PDF pages 133 and 134/357)****, Groundwater Elevation Contours, would be more informative if the elevation data for each well was displayed.*

Response:

Including well-specific groundwater elevation data for all the wells used in these contour maps would make the figures cluttered and harder for readers to understand. The groundwater elevation data used in these maps will be transmitted to DWR as part of the submittal of the GSP and can be downloaded from the SGMA data portal thereafter.

COMMENT 5. ***Page 4-12 (PDF page 114/357). Section 4.7.1 – Water Quality Goals****. "The recommended SMCL for TDS is 500 mg/L with an upper limit of 1,000 mg/L…". The inclusion of a "limit" of 500 mg/L seems unnecessary and confusing if the actual limit is 1,000 mg/L. This appears to reflect language from the General Plan. However, it's not useful to repeat this language if there is no direct impact on the GSP, or the minimum thresholds established for water quality in the GSP. Almost none of the water quality data presented for the Basin is lower than 500 mg/L, so it only serves to create a reference that is not likely to be achieved, implying a failure of an existing regulatory program.*

Response:

The text has been updated to clarify that the 500 and 1,000 mg/L concentrations are recommended values and not limits. However, the SMCLs and RWQCB General Basin Plan Objectives include all three values, and it is necessary to accurately state what the RWQCB objectives are. SGMA requires that sustainability criteria be established with reference to regulatory standards (see Section 6.6.5.6), and thus these have a direct impact on MTs. Note that the values are RWQCB General Basin Plan Objectives from the Water Quality Control Plan for the Central Coastal Basin (Basin Plan) and are not from any General Plan (relating to land use planning). As indicated in Section 4.7, TDS concentrations are generally high and reflect natural high background levels; this is not a management failure.

COMMENT 6. ***Figures 4-19 and 4-21 (PDF pages 144 and 146/357)*** *display transient chemographs for TDS and nitrates. The display of these data would be easier to interpret if individual graphs were placed on a map, as they are with the hydrographs in Figures 4-4 through 4-7. Then the reader would not need to refer back to a location map (Figure 4-15) to find out the locations of the individual points.*

Response:

The well locations and time concentration plots are presented in the section, but we will consider the suggestion for graphics in upcoming Annual Reports and Five-Year Updates.

COMMENT 7. ***Figures 4-19 and 4-21 (PDF pages 144 and 146/357)*** *Some of the data trends presented in Figures 4-19 and 4-21 are not immediately intuitive, and may merit some discussion in the text. For example, in Figure 4-19, TDS concentrations in well MW-42 are stable at about 400 mg/L forover a decade, then spike suddenly to the 1,500-1,900 range after 2015. In Figure 4-21, nitrate concentrations for well MW-31 increase suddenly from around 50 mg/L to over 200 mg/L after 2008. Interpretation of these data may be more obvious if individual graphs were displayed on amap, as discussed in Comment 6.*

Response:

The changes in water quality for these specific wells are a result of local sources including facilities that are regulated by the RWQCB. Further discussion of these wells can be found in the 2016 and 2019 Annual Groundwater Reports (Appendix F), which include updates on water quality.

COMMENT 8. ***Page 4-15 (PDF page 118/357). Section 4.8.1 - Selenium****. The text in this discussion mixes units,referencing both mg/L and ug/L, which creates some confusion. Recommend using consistent units in this discussion. Same comment for Section 4.8.3 – Boron.*

Response:

The units have been revised for consistency.

COMMENT 9. ***Page 4-16 (PDF page 118/357). Section 4.8.3 – Boron****. The second paragraph references an area of historically elevated boron concentration. If this text is presented, it may be helpful to include a display of the area on one of the existing figures.*

Response:

Boron has not been selected as a constituent to determine sustainability as it is naturally occurring and unlikely to be mobilized by local groundwater management. North San Benito has been characterized by maintenance of groundwater levels within a stable operating range, which will be continued given the groundwater level MTs. The geographic extent of boron is discussed in Annual Groundwater Reports (Appendix F), but the best map is in the SBCWD 2004 Development of a Groundwater Quality Monitoring Network.

COMMENT 10. ***Page 4-16 (PDF page 118/357).*** *There appears to be a typographical error in the "Arsenic"paragraph of this section.*

Response:

The text has been corrected.

COMMENT 11. ***Page 4-18, paragraph 2 (PDF page 120).*** *This sentence may not be necessary and should be considered for removal from the GSP: "If a gaining stream is the natural discharge point for agroundwater basin, pumping anywhere in the basin can potentially decrease the outflow, particularly over long time periods such as multi-year droughts."*

Response:

We believe the statement is correct and relevant to the discussion of interconnected surface water.

COMMENT 12. ***Figure 4-22 (PDF page 147)****, general comment on display. Groundwater elevation contours are the same color as roads, and some of the road labels are hard to find (like Highway 156). The text references the road locations, but these are difficult to find on the figure. Suggest some graphical revisions to this figure for clarity.*

Response:

The colors of the contours have been changed to be distinct from roads.

COMMENT 13. ***Tables 5-3 and 5-4 (PDF pages 160,161).*** *Outflows are greater than inflows in Table 5-3 and 5-4.It is stated in the text description of Tables 5-2 through 5-4 inflows equal outflows. Inflows do equal outflows in table 5-3 and 5-4 if CVP imports are not included in the sum of inflows. The rationale is included as the last sentence on page 5-8. Perhaps a note should be included on thetables. Note in Table 5-3 and 5-4, 1st column, last row, "except CVP" has a typo.*

Response:

A footnote has been added to the tables and the typographical error has been corrected.

COMMENT 14. ***Figures 5-12 and 5-13 (formerly 5-10 and 5-11) (PDF page 186,187).*** *GSI recommends that the line graphs shown on these figures be labeled as representing Cumulative Change in Storage for greater clarity.*

Response:

The title of the figure has been changed to indicate that the storage changes are cumulative.

COMMENT 15. ***Water Budget****. GSI recommends the development of a consolidated table and a consolidated figure showing the basin-wide water balance.*

Response:

The water budget is presented by management area alone because the four management areas are quite different from a hydrogeologic and management perspective. Presenting a consolidated table is not necessary or particularly helpful for the sustainable management of this groundwater basin.

COMMENT 16. ***Table 6-1 (PDF page 197/357).*** *The 5th column in this table lists the minimum*

thresholds proposed for the key wells, and are discussed as such in the ensuing text. This column should simply be labelled with reference to "Minimum Thresholds", thus using the SGMA language andmaking the MTs clear.

Response:

The table has been modified.

COMMENT 17. ***Page 6-12 (PDF page 199).*** *The definition of the Minimum Threshold for Chronic Lowering of Groundwater Levels reads: "The Minimum Threshold for defining undesirable results relative to chronic lowering of groundwater levels is defined at each Key Well by historical groundwater lowlevels adjusted to provide reasonable protection to nearby existing wells. Undesirable results areindicated when two consecutive exceedances occur in each of two consecutive years, in sixty percent or more of the Key Wells* ***in each Management Area****." Based on the description provided in the previous paragraph "… undesirable results could occur in one MA and not the others." Considering this, we suggest that the bold text in the MT definition above be replaced with: "…****to be assessed separately for each Management Area****".*

Response:

Comment noted, no change made.

COMMENT 18. ***Section 6.2.7 (page 6-14, PDF page 201/357).*** *It is our interpretation of SGMA requirements that Measurable Objectives (MOs) be defined as a numerical value. Section 6.2.7 (page 6-14, PDF page 201/357) uses vague language of "…to maintain groundwater levels within the operating range…". We suggest that a specific numerical water level indicative of current average or high water conditions be selected for each key well, and included in Table 6-1 as a column. This would maintain the current approach as presented but would define MOs with greater specificity as required by SGMA.*

Response:

The full text is "The Measurable Objective is to maintain groundwater levels above the groundwater level MTs (as quantified above or the interconnected surface water MTs, whichever is higher at the relevant measurement event), and to maintain groundwater levels within the operating range as defined in this section." [Emphasis added.] Adding a column to Table 6-1 would not acknowledge that the MOs also involve the MTs for interconnected surface water (Table 6-6), whichever is higher at the time. The text has been edited to refer to the two tables. A specific value for the MO would be misleading; a current average or high groundwater level is not necessarily more desirable than a groundwater level that is just one foot above the MT. The fact is that groundwater levels and storage in North San Benito are managed sustainably through conjunctive use that requires variation across the operating range.

COMMENT 19. ***Page 6-19 (PDF page 206/357).*** *It would provide clarity if the paragraph*

beginning "The Minimum Threshold for storage…" specifically referenced the numerical values presented inTable 6-1.

Response:

A reference to Table 6-1 has been added in the paragraph above, but a reference to a specific table is not included in the formal, inset statement of the Minimum Threshold for storage.

COMMENT 20. ***Section 4.7.4 Page 4-14 (PDF page 116).*** *The statement made about average nitrate concentrations in the first paragraph (and presented in Table 4-3) does not seem consistent with the data presented on Page 6-32, including Table 6-4.*

Response:

We edited the sentence on page 4-19. The reference is to the average concentrations of the SBCWD monitoring wells whereas Table 6-4 reflects the median of all available data.

COMMENT 21. ***Page 6-32 to 6-34 (PDF pages 219-221).*** *Considering the expected increase in TDS and N concentrations in groundwater documented in the GSP it seems overly aggressive to set the MTsfor each constituent as the percentage of wells with concentrations exceeding the regulatory criteria based on current conditions (2015-2017). This definition means that current conditions =undesirable result. With projected increases in both TDS and N concentrations this leaves no room for potential corrective actions and sets the Basin up for immediate non-compliance. Consider revising to less stringent thresholds that do not result in immediate non-compliance for TDS and N concentrations in groundwater.*

Response:

Establishment of MTs for TDS and nitrate included detailed discussion over multiple meetings by the Technical Advisory Committee, followed by presentation and discussion in a public workshop. The discussion in the GSP Section 6.6.5 recognizes data limitations and the problem of legacy loading and takes the approach to proceed with measures to reduce loading of nitrate and salts. The MTs are the current starting point and refer to the RWQCB Basin Plan objectives and the State's non-degradation policy per GSP Regulations. Given historical and ongoing groundwater use, the current conditions are sustainable.

COMMENT 22. ***Tables 6-4 and 6-5. (Page 6-32 and 6-33, PDF pages 219-220/357).*** *The percentage values presented in these tables are discussed and presented in the text as the Minimum Thresholdcriteria for water quality for TDS and nitrates. Therefore, we suggest it would provide greaterclarity if the term "Minimum Threshold" were utilized in the table title or column headers.*

Response:

The term "minimum threshold" has been added to the table headers.

COMMENT 23. ***Page 6-46,47 (PDF pages 233,234).*** *The SMC for Depletion of Interconnected*

Surface Water is set using groundwater elevations in deep aquifer wells as a proxy. This is not appropriate considering ample evidence presented in the GSP that the shallow alluvial aquifer behaves independently from the deep aquifer. GSI recommends that time series Enhanced Vegetation Index (EVI) analyses be considered to supplement use of deep aquifer monitoring well groundwater elevations as proxy MTs for the Depletion of Interconnected SW SMC. The deep aquifer wells operate independently from the alluvial aquifer as evidenced by the comparison made between NDVI/NDMI and calibrated groundwater model water level fluctuations presented in the GSP (see GSP Fig. 6-9). This lack of correlation demonstrates the poor utility ofusing the deep aquifer wells to monitor the interconnected SW SMC.

Response:

The GSP does not characterize the Basin as having "shallow" and "deep" aquifers. It repeatedly notes the inability to differentiate between alluvial deposits and the Purisima Formation based on lithology (for example, Sections 3.6.1 and 3.9.3). Although the GSP describes Holocene alluvial deposits as the "principal aquifer" and the Plio-Pleistocene Purisma Formation as a "secondary aquifer", it does not assert that they have different water levels. The GSP does not identify a thin surficial aquifer along waterways with different water levels that would affect the distribution of phreatophytes. The GSP notes that water levels vary with depth within the basin materials and that the lack of shallow monitoring wells near riparian areas is a data gap (Section 7.5.1 and Table 7.2) and commits to installing six wells to improve monitoring related to GDEs (Section 8.10.1).

The Enhanced Vegetation Index is another spectral ratio product derived from Landsat satellite imagery. It can have advantages over NDVI and NDMI in certain circumstances (such as rainforests and areas with snowpack) but would likely produce similar results as NDVI and NDMI in the San Benito Basin. Notably, DWR's SGMA data portal website includes NDVI and NSMI data sets but not EVI data sets.

The GSP text agrees that water levels from deep water supply wells are inadequate for monitoring water table conditions relevant to riparian vegetation, and installation of new shallow monitoring wells in those areas is among the GSP management actions (Section 8.10.1)

COMMENT 24. ***Groundwater Dependent Ecosystems (GDEs)***

COMMENT 24a. *Nowhere are GDEs specifically identified in the GSP (this is a requirement of SGMA).*

Response:

The following text has been added to the first paragraph of Section 4.11.6 Identification of Groundwater Dependent Ecosystems: "Figure 4-22 identifies potential GDEs as phreatophytic riparian vegetation and as springs and seeps, and also identifies gaining stream reaches (based on depth to groundwater)."

Section 4.11: *The GSP seems to conflate Riparian Vegetation with vegetation GDEs. This is probably OK, but to satisfy SGMA requirements the GSP should specifically identify these as vegetation GDEs if that is what the author believe they represent.*

Response:

The 4th paragraph of section 4.11.3 Riparian Vegetation has been changed to include this first sentence: "For the purposes of this GSP, riparian vegetation GDEs are defined as areas of dense riparian tree canopy more than one tree wide along streams where depth to groundwater is plausibly less than 30 feet."

COMMENT 24b. ***Page 4-19 (PDF page 121).*** *In the process of identifying Riparian Vegetation the GSP mischaracterizes the shallow alluvial water table as "streambank irrigation". This term is misleading. While the shallow alluvial water table may exist due to so called "streambank irrigation" from a losing stream reach it is still in-fact a shallow alluvial water table. The GSP describes an effort to avoid including these "streambank irrigated" vegetation areas from inclusion in the Riparian Vegetation classification by using a 100- ft minimum width screening step. This does not seem appropriate. Regardless, if one zooms way in, the resulting Riparian Vegetation extent shown on GSP Fig. 4-22 appears to be reasonable.*

Response:

The canopy width criterion was included because some channels in areas with large depths to water have a single line of (often sparse) vegetation along one or both banks that is distinct from vegetation farther from the stream (often annual grassland). Although the streambank vegetation probably enjoys higher soil moisture lingering after ephemeral winter stream flows, that does not necessarily imply there is a perched aquifer. And if there is a perched aquifer, it would not be affected by recharge and pumping in the principal aquifer, which is the focus of groundwater management in the GSP. Where the water level in the principal aquifer is close to the ground surface, depth to water is usually shallow for a considerable distance from the channel, resulting in a wide area of phreatophytic vegetation. Those are the areas appropriately identified as riparian vegetation GDE's (Fig. 4-24) and used as the basis for sustainable groundwater management.

COMMENT 25. ***Section 8.7.1.3.*** *The GSP states that SBCWD water quality sampling is completed quarterly to semiannually. In response to a prior comment suggesting that this interval of sampling is overkillTodd's response indicated the revised text of the Public Draft GSP would indicate a minimum interval of annual sampling here and in Section 6.6.4.1. This recommendation is not stated clearly in the text.*

Response:

In Sections 8.7.1.3 and 6.6.4.1, the discussion has been updated to indicate a recommendation for a monitoring frequency of at least annual.

COMMENT 26. ***Subsidence****: The GSP includes statements suggesting that, while no subsidence problems have been reported, there is a relationship between subsidence and local groundwater pumping. However, this supposed relationship is not supported by the*

GPS land surface elevation data presented in Figure 4-14 which show, at most, a land surface decline of 1 inch between 2004 and 2018. The InSAR data on Figures 4-12 and 4-14 are inconsistent with each other, with the GPS data, and with groundwater levels which were not declining during the time periods of theInSAR data. The GSP should be modified to remove statements that subsidence associated withgroundwater extraction is occurring and to clarify the discrepancies in the datasets.

Response:

In Sections 4.3 and 6.4, the GSP presents available InSAR and UNAVCO data that, while limited, indicate subsidence. While the indicated land surface changes are small, subsidence is widely recognized as irreversible, so small changes over time represent potential undesirable results, such as incremental but permanent loss of drainage capacity. SGMA (see §10727.2) requires monitoring if subsidence has been identified as a potential problem. In accordance with SGMA and the GSP's stated objective to prevent subsidence, the GSP has included subsidence monitoring and establishment of sustainability criteria to assess the potential problem. This monitoring will document any relationships between subsidence and local groundwater pumping, as requested in the comment, and will minimize any potential subsidence problems.

COMMENT 27. ***The Groundwater Model Report*** *tables and figures are not included in* ***Appendix G****. Pleaseprovide.*

Response:

The Model Report tables and figures will be included in the Final GSP.

List of Changes to Public Draft Groundwater Sustainability Plan, North San Benito

Topic	GSP Section	Word Document Page	Description of Changes*
Disadvantaged Communities	2.1.2.1	2-2	Updated description of DAC mapping
Disadvantaged Communities	Figure 2-6		Update of DAC mapping
Disadvantaged Communities	Appx H Figure 1		Update of DAC mapping
Land Subsidence	2.1.4	2-7	Clarification of DWR mapping program
Recharge and Discharge Areas	3.1		Added a footnote to Figure 3-11 clarifying discharge areas.
Groundwater Elevations and Trends	4.1.3	4-2	Clarified consideration of structures that affect groundwater flow
Water QualityObjectives	4.7.1	4-12	Clarified SMCLs for TDS
Perchlorate and Selenium	4.8.1	4-15	Made units consistent
Boron	4.8.3	4-16	Made units consistent
Nitrate as NO3	4.7.4	4-14	Edited the sentence for clarity
Interconnection of Surface Water and Groundwater	4.11	4-18	Added text to describe Figure 4-22, Surface Water Connected to Groundwater
Riparian Vegetation	4.11.3	4-20	Provided definition of riparian vegetation
Springs and seeps	4.11.4	4-20	Provided definition of wetland GDEs and clarified wetland GDE sites
GDEs	4.11.6	4-21	Added text to describe potential GDEs on Figure 4-22
Riparian Vegetation	4.11.7	4-21	Defined riparian vegetation
Animals Dependent on Groundwater	4.11.8	4-23	Described Figure 4-24 riparian vegetation and steelhead passage streams
Surface Water Connected to Groundwater	Figure 4-22		Adjusted colors, added labels, added phreatophytes, indicated all 13 wetland sites
Surface Water Balance	5.5	5-8	Clarified change in surface water in storage as very small water balance component. Footnoted relevant tables.
Change in Groundwater Storage	Figure 5-12		Changed title to add "cumulative" change in storage
Future Change in Groundwater Storage	Figure 5-13		Changed title to add "cumulative" change in storage.
Groundwater Level Measurable Objectives	6.2.7	6-14	Noted relevant tables for definition of MOs
Well Permitting	6.2.7.1	6-14	Added text describing outreach to drillers about MTs
Water Level/Water Quality Monitoring	6.6.4.1	6-30	Clarified discussion of monitoring frequency to quarterly to a minimum of annually
Minimum Threshold and Beneficial Uses	6.7.6.3	6-48	Explained effect of Interconnected Surface Water MTs on Pajaro River Wetland Bank
Managed Aquifer Recharge (MAR) Study	8.4, 8.10.4	8-14 to 8-18, 8-43	Clarified text that MAR TM will be provided on SBCWD website, not in appendix; in sections 8.4, 8.4.5, 8.4.9.
Siting of New Monitoring Wells	8.7	8-32	Clarifies that Appendix H includes documention of siting for new monitoring wells
Remote Sensing Pilot Study	8.7.1.1	8-33	Simplified description of remote sensing pilot study
Water Level Monitoring	8.7.1.2	8-34	Added sentence about reviewing the monitoring schedule and modifying as needed
Well Permitting	8.7.1.3	8-34	Added section about enhancing outreach on well permitting
Pilot Study	8.7.1.4	8-34	Clarified text on pilot program.
Remote Sensing for Groundwater Use Evaluation	8.7.2	8-35	Updated description of investigation of remote sensing to evaluate groundwater use
TM on Siting of New Monitoring Wells	8.7.3	8-36	Clarified contents of Monitoring Well Drilling and Construction Technical Memorandum
Remote Sensing for Groundwater Use Evaluation	8.7.6	8-36	Updated text about exploration of remote sensing options to evaluate groundwater extraction.
Community Engagement Program	App D		Updated and completed
Numerical Model Report	App G		Included all tables and graphics.
			* Not including minor edits.